May 2020

The Impact of Gender and Class on Disease and Trauma in 18th Century London: A Case Study of Three Cemetery Populations

Maria A. Barca
University of Wisconsin-Milwaukee

THE IMPACT OF GENDER AND CLASS ON DISEASE AND TRAUMA IN 18th CENTURY LONDON: A CASE STUDY OF THREE CEMETERY POPULATIONS

by

Maria A. Barca

A Thesis Submitted in

Partial Fulfillment of the

Requirements for the Degree of

Master of Science

in Anthropology

at

The University of Wisconsin-Milwaukee

May 2020

ABSTRACT

THE IMPACT OF GENDER AND CLASS ON DISEASE AND TRAUMA IN 18th CENTURY LONDON: A CASE STUDY OF THREE CEMETERY POPULATIONS

by

Maria A. Barca

The University of Wisconsin-Milwaukee, 2020
Under the Supervision of Professor Bettina Arnold, PhD

The bioarchaeological study of paleopathology integrates interdisciplinary approaches, such as gender and class theory, and the study of trauma and disease. Using multiple lines of evidence, this thesis examines the impact of gender and class on skeletal evidence for disease and trauma in three 18th century London cemeteries serving different socio-economic populations. Contemporary written sources for prescribed gender and class roles are tested against the bioarchaeological evidence to investigate the extent to which these norms reflected lived reality or differentially impacted the incidence of trauma and disease in populations of varying socioeconomic status. Conformity to prescribed gender roles should be reflected in higher rates of occupational trauma and disease in men because they were expected to engage in higher risk activities as the "protectors" of their families and households. Women, as the caretakers of children and the home, should exhibit lower rates of occupational trauma but higher rates of nutritional stress due to pregnancy, menopause and more limited access to nutrient-rich foods. Differential resource accessibility limiting rigid conformity to social norms predicts more fluid gender roles should be seen in lower class populations whereas class privilege permitting greater access to resources should be reflected in greater conformity to strict gender roles.

To my mom,

Who taught me that everything would be okay, no matter what.

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

PAGE

LIST OF TABLES

PAGE

ACKNOWLEDGEMENTS

I would first like to offer my sincere thanks to my academic advisor and thesis supervisor Dr. Bettina Arnold for her guidance throughout this entire process. Her dedication and support were the inspiration behind my motivation to write a thesis that I could be proud of. Even when I found myself in those inevitable moments of disappointment and frustration, Dr. Arnold's direction and encouragement aided me in going forward, her words resonating when writing felt difficult and ideas were hard to come by. Without her help I know I would not be where I am now, and for that I am deeply grateful.

Similarly, I would like to thank Dr. Patrick Gray and Dr. Patricia Richards, not only for agreeing to join my thesis committee, but for offering support and guidance throughout this process. Dr. Gray's assistance on my statistics has proven to be invaluable, and I am both humbled by and deeply appreciative for his help. Dr. Richards, too, has been a lively source of ideas and questions that forced me to think in ways I had not considered previously. Her enthusiasm whenever we spoke about my work provided me with the encouragement and excitement necessary to keep moving forward and bring new ideas into my thesis.

I also want to offer my sincere thanks to the Museum of London's Centre for Human Bioarchaeology for providing open source data on the centuries of individuals unearthed from the City of London, including those studied in this thesis. Without their time and dedication to providing and maintaining accessible data, not only would this thesis not have been possible, but neither would have the many inspiring pieces of literature that aided this thesis.

Lastly, I want to thank to my mom and brother for their undying love and support throughout this process, and to my friends, who were a constant source of laughter and happiness for me, no matter how far away I was. Let's play Dungeons & Dragons soon.

Chapter 1: Introduction

Project Description

This project compares the frequency of disease and trauma in three London populations that span the Long Eighteenth Century to investigate the extent to which prescribed gender roles were performed according to what was socially expected of men and women based on gender and social class. The Long Eighteenth Century is defined as the period between 1650 and 1850 (Shoemaker 1998:5). The sample populations analyzed in this study were drawn from database information on three London cemeteries containing populations from a range of socioeconomic backgrounds: Chelsea Old Church (1712-1842), a wealthy rural cemetery, St. Benet Sherehog (1666-1853), a middle-class urban cemetery, and St. Bride's Lower (1770-1849), a working-class urban cemetery.

This study tests the hypothesis that men should exhibit higher incidences of trauma and disease as they were expected to engage in more high-risk labor and high stress lifestyle roles than women in accordance with their prescribed gendered positions as protectors, economic providers, and heads of their households. Women in the sample are expected to exhibit less evidence of disease and trauma as they were "shielded" from the stressors that disproportionately impacted men. However, the intersection of socioeconomic status with idealized gender roles is expected to produce varying manifestations of trauma and disease profiles in these three communities. Do the residents of wealthy, middle-class, and poor populations reveal different patterns of trauma and disease due to the intersection of class and gender as filtered through socioeconomic realities? This study uses bioarchaeological and gendered approaches to paleopathology, as well as statistical and textual analyses, to explore how gender roles were

enacted in three different socioeconomic communities in post-medieval London. The goal of this project is to understand whether and how these expected roles, as outlined and reified in contemporary literary sources, aligned with the lived experiences of Londoners as reflected in trauma and disease profiles.

Background

Bioarchaeology, Paleopathology, and Gender Archaeology

Bioarcheology is defined as "the study of human remains from archaeological contexts" (Larsen 2015:3). The discipline prioritizes interdisciplinary approaches to the study of human skeletal remains within their respective cultural contexts. According to Larsen (2015), these contexts include "all potential sources, archaeological and otherwise, such as burial and social inference, diet, climate, living conditions, and all else that is inferred or documented that may inform our understanding of the people the skeletons represent". Paleopathology, on the other hand, is not rooted in archaeological methods or research (Buzon 2012:58), but it is applied to such contexts.

Paleopathology is defined as the study of "trauma, antemortem cultural modifications of the skeleton and teeth, degenerative conditions, age-related bone loss, occupational indicators, and nutritional deficiencies and other signs of dietary stress" (White et al. 2012:429). In the early years of the field, anatomists focused primarily on prehistoric animal remains (Grauer 2017:904; White et al. 2012:429), but the shift into racial morphology and descriptivism dominated the field by the 19th century (Armelagos and Van Gerven 2003:54). Early paleopathological studies of human diseases were often removed from their archaeological contexts (Buzon 2012:59); as a

result, diagnosis, description, and classification were considered the main priorities in the study of prehistoric diseases (Ortner 2011:5).

Paleopathology's integration with processual archaeology in the 1970s and 1980s combined the shared methods of the two disciplines to create what would become known as bioarchaeology (Armelagos and Van Gerven 2003:58). The biocultural approaches used in bioarchaeology consider culture to be a major contributor in the shaping of the body; this includes the view that disease, too, can be influenced by cultural pressures and that pathologies have the potential to shape an individual's lived experience. Paleopathology is now considered one of the main focuses of bioarchaeology (Buzon 2012:59), so much so that paleopathology's embrace of the interdisciplinary biocultural methods generated by bioarchaeology resulted in what Armelagos and Van Gerven (2003:58) have termed the synonymous association of bioarchaeology and paleopathology for many skeletal biologists.

The influence of gender and feminist theory in archaeology have permeated its subdisciplines, including bioarchaeology and the bioarchaeological study of disease. The history of gender in archaeology in the United States extends back to the seminal piece by Conkey and Spector (1984), in which the authors argue that the prevalence of androcentrism in archaeology projects contemporary Anglo-American standards of gender roles and expectations onto the past (Conkey and Spector 1984:3). This narrow perspective stereotypes gender roles in nearly every area of life, including labor, subsistence strategies, diet, and childcare roles, resulting in contemporary notions of gender configurations informing interpretations of historic and prehistoric social organization (Conkey and Spector 1984:11). Feminist and gender critiques of archaeology, as argued by the authors, reconceptualized how gender should be viewed in archaeology—not as a biological certainty, but as:

> a complex system of meaning . . . that lies at the core of how people in particular cultures identify who they are, what they are capable of doing, what they should do, and how they are to relate to others similar to and different from themselves (Conkey and Spector 1984:16).

Furthermore, the authors argue that it is archaeology's epistemologies and methods that hold back the field, not the data or the pursuit of gender as a viable topic of study (Conkey and Spector 1984:21).

Since the publication of Conkey and Spector's (1984) piece, gender and feminist archaeology have undergone a number of changes, specifically due to the theoretical and methodological influence of third wave feminism as it arose in the 1990s. Queer studies and masculinity studies, for example, have grown to prominence in gender and feminist archaeology as theoretical frameworks necessary to dismantle the restrictive heteronormative and hypermasculine binary from which many archaeologists operate (Alberti 2013:87; Hays-Gilpin 2007:439). By studying masculinity through a feminist lens, archaeologists can not only deconstruct androcentric presumptions present in the field that assume men are the primary actors in the past, but also more accurately reconstruct masculinity and the lived experiences of men (Skogstrand 2010:59). Queer theory, on the other hand, focuses on the creation and transformation of identities and the social negotiation that all individuals undergo in relation to their world. The focus is not solely on the sexually queer but on the socially different and abnormal, regardless of how that may have been perceived in the past (Blackmore 2011:77-79).

Gender and feminist archaeology have also been critiqued for their shortcomings in developing theoretical frameworks and methodologies (Hill 1998:100). As explained by Hill (1998:103), one of the few gender-focused methodologies developed by Spector (1983, 1991), the task differentiation approach, uses "ethnohistoric and native informant accounts to address

gender-specific tasks and their material/spatial dimensions in the past". However, this methodology was later rejected by Spector due to the biases present in ethnohistoric and archaeological texts (Spector 1991:489). Additionally, debate within gender and feminist circles in archaeology has centered around whether gender archaeology should be considered feminist or if the two should be separated to avoid the politicization of archaeological interpretation (Englestad 2007:218; Hays-Gilpin 2000:93; Hill 1998:103; Rubio 2011:21; Sørensen 2013:406). While many of the critiques of feminist and gender archaeology are valid, the field(s) have developed in tandem over time as theory, methodology, and research interests expanded and diversified. As a result, the questions being asked, the data being collected and interpreted, and the results being generated from these frameworks and methodologies have broadened our understanding of the past.

Bioarchaeology and paleopathology's integration of gender and feminist studies has yielded a wealth of research regarding biocultural approaches to human skeletal remains and disease. Bioarchaeological research on gender has spawned an integrative approach to the human skeleton in archaeological studies, including the importance of intersectionality, reflexivity, and the plasticity of the body (Joyce 2017:2-4; Sofaer 2012:227). These biocultural approaches to the study of past humans seek to emphasize the importance of identity and change over time within the individual human skeleton as well as the populations to which individuals belong. This insight has been extended to the study of trauma and disease in bioarchaeology.

Violence is one of the social phenomena being reevaluated from newly gendered perspectives. As Shannon A. Novak (2017:130) explains, violence shapes individual lived experience as well as group identity. However, these experiences in relation to gender are being reexamined to challenge the stereotypes with which they are often associated. For example,

viewing violence faced by women as strictly domestic implies a woman's violent experiences are apolitical and private compared to men's political and thus public violence (Novak 2017:131). Bone frailty, too, has been reevaluated regarding its traditional gender associations. Osteoporosis, specifically, tends to be viewed as a female condition due to the natural biological process associated with menopause, which causes rapid bone loss. As a result, bone frailty is associated more frequently with females due to the onset of menopause rather than other biosocial factors such as "physical activity, diet, and nutrition" (Agarwal 2017:169). However, bone loss and frailty should not be solely designated as "female diseases" or associated only with post-menopausal factors, but rather should be viewed as a biosocial culmination of events and activities that can differentially impact individuals according to socially prescribed spheres of activity over the life course.

The study of gender in the past is greatly enhanced when combined with emic and etic written sources as well as material goods and human skeletal remains (Mehler 2012:13). Historical archaeology, with these advantages, has benefited in some ways by engaging with gender later than other archaeological studies. As Andrea C. Vermeer (2009:320) explains, quoting Seifert (1991:2), historical archaeologists were not asked to find women in the past; instead, they were encouraged to identify material culture "associated with women" and were "asked to stretch further and to examine the relationship between their data and gender as a structural principle of culture".

By the time gender was introduced into historical archaeology, gender theory was already well-integrated into the field and priorities were beginning to expand beyond the "add women and stir" approach (Hays-Gilpin 2000:94). However, as Vermeer (2009:320) notes, historical archaeology's reliance on the binary opposition of gender categories stunted the growth of

gender studies within historical archaeology, as gender was generally not seen as fluid and dynamic but rather as static and unchanging. This perception of gender as binary resulted in studies where the presence of gender non-conforming behavior was being interpreted as individuals "infiltrating" other gendered spheres rather than acknowledging gender as dynamic and gender categories as capable of change (Vermeer 2009:320). Historical archaeology has made strides, however, and is beginning to recognize gender as a fluid and relational concept that is not unchanging and static as previously conceived (Vermeer 2009:329). It is in light of such developments in gender studies in historical archaeology and bioarchaeology that the study of gendered patterns of disease in post-medieval Londoners can be approached from a comprehensive and interdisciplinary perspective.

London Society during the Long Eighteenth Century

The Long Eighteenth Century is defined in England as the time period between 1650 and 1850 (Shoemaker 1998:5). As Shoemaker (1998:5) explains, this was a period of "immense social, economic, political, and cultural change" in England. In London specifically, the Long Eighteenth Century was marked by intensifying class stratification, a lack of public sanitation, mass migrations causing a population boom in urban centers resulting in overcrowding and the rampant spread of disease, and a decrease in the monarchy's power, as well as widespread literacy and the invention of the novel (Shoemaker 1998:5-6).

It was during this time that London was becoming a "compact metropolis extending far beyond its original City boundaries" (Rudé 1971:1). A major contributing factor in the city's growth was the influx of immigrants entering London. As Rudé (1971:7-8) explains, laborers, both male and female, arrived from Scotland, Wales, Ireland, Germany, the Netherlands, and France, as well as the West Indies, India, and North America during this period. People from the

English countryside, too, made their way into London to find work and economic opportunity (Rudé 1971:7). The Industrial Revolution of the 17th century spurred major economic and environmental changes that created greater divisions between the classes, disrupting the City of London's previous occupational distinctions and dividing the city along class lines (Pinhasi et al. 2006:373). The city was informally divided into west and east ends according to socioeconomic status—the east side housed the poor and industrial growth, while the west side housed the "fashionable and rich" (Rudé 1971:10).

Despite mass migration into the city, London's population did not increase due to natural reproductive rates of previously-established London citizens—instead, between 1727 and 1750, as recorded in the Bills of Mortality, London saw a decrease in births and baptisms and an increase in deaths and burials (Rudé 1971:5). As Rudé (1971:5) notes, this uptick in deaths "exceeded any that had been known since the great Plague". It was not until the 1760s that baptisms—a sign of a healthy child that survived the dangers of infancy—began to exceed deaths (Rudé 1971:6).

Socioeconomic divisions within the London population reveal the vast wealth disparities present in the city at the time, as well as how these inequalities created strain and resulted in social unrest. Rudé uses *Robinson Crusoe* author Daniel Defoe's breakdown of London's social classes to discuss these socioeconomic groups and how they coexisted. The main groups relevant for this study are as follows: "the great" or the aristocracy, "the rich", "the middle sort", and "the poor" (Defoe 1709:363, quoted by Rudé 1971:37). "The great", or the aristocracy, who controlled Parliament, gained their wealth through land ownership, real estate, inheritance or marriage, and politics, and often owned homes in the countryside, such as in Chelsea, one of the cemetery locations included in this thesis, to escape the city (Rudé 1971:38-39;47). "The rich"

included the financial and mercantile bourgeoisie who were "enriched by the commercial and colonial expansion of the Commonwealth" (Rudé 1971:52). "The middle sort" consisted of the laborers who worked but were not financially strained (Rudé 1971:56), and "the poor" were often the petty tradesmen, unskilled and semi-skilled day laborers, domestic workers, criminals, and beggars who were unemployed or "unemployable" (Rudé 1971:83). The latter group was disproportionally impacted by disease and plague, with the poorest individuals often perishing of starvation in the streets (Rudé 1971:87). Due to the poor living and working conditions, low wages, and high food prices among the lowest economic classes, social and political unrest often erupted in the form of rioting and strikes by London's working and poor populations (Rudé 197:183).

It was during this time, Shoemaker (1998:6) argues, that differences between the genders as they are defined today, including the distinction between the private and public spheres and women and men's respective designations as domestic and political, came into prominence. If these social roles were being acted upon, both class and gender differences present during the Long Eighteenth Century should be visible bioarchaeologically and this project will attempt to test that assertion in three London cemeteries dating to this period.

The industrialization and urbanization of London brought about country-wide changes in health and status, including declines in dental health associated with the introduction of refined sugars (Renshaw and Powers 2016:164), increased morbidity rates for low status groups living in crowded and unsanitary urban areas, and an increase in nutritional diseases due to continued class stratification that impacted access to healthy foods and clean and safe environments (DeWitte et al. 2016:242, 248; Mant and Roberts 2015:190). Due to the distinctions seen in London at the time, a vast range of studies have been conducted to better understand how class

and gender impacted differential access to resources which, in turn, would impact the rates and frequencies of disease and trauma seen in certain groups.

For example, health and recreational consumption of tobacco and alcohol played a role in distinguishing between men and women based on socioeconomic status. In a study by Walker and Henderson (2010), the authors demonstrate this by focusing on the presence of pipe facets and lingual stains on teeth in the 19th century poor population of St. Mary and St. Michael church cemetery in Whitechapel, London. The authors argue that the presence of pipe facets and lingual stains, which are indicative of pipe smoking, manifest themselves differently along gender and class lines. In a sample of 248 individuals with complete or partial dentition, 39.6% of males had pipe facets compared to 2.9% of females, 25.9% of males had lingual stains compared to 3.9% of females, and 22.3% of males had both facets and stains compared to 1% of females (Walker and Henderson 2010:211). The authors also examined the presence of periosteal lesions on ribs, which typically indicate the presence of "infection, trauma, scurvy, venous stasis, secondary hypertrophic osteoarthropathy, and neoplastic disease" (Walker and Henderson 2010:214). Of the 268 adults in this sample, males were impacted more frequently than females; however, class distinctions were also apparent as the authors compared the cemetery population of St. Mary and St. Michael to the wealthier community of St. Marylebone, also in London. While 8.9% of the sample from St. Mary and St. Michael showed signs of ribs with periosteal lesions, only 2.1% of the sample showed signs of the lesions at St. Marylebone, suggesting that the poorer population experienced more respiratory diseases, poorer living environments, and engaged in more hazardous occupational activities than the wealthier population (Walker and Henderson 2010:215).

It is widely argued that, in stratified societies, class status is a primary contributor to the differential impact of disease and trauma between social groups (DeWitte et al. 2015:243). However, overarching social forces that impact all individuals of a society—not just the weakest, poorest, or most vulnerable—can be seen in archaeological and paleopathological contexts. For example, in a study by Mant and Roberts (2015), the authors examined dental caries in 78 individuals from Chelsea Old Church, a wealthy rural population, and 90 individuals from St. Bride's Lower, a working-class urban population, both of which are included in this study. Despite the documented class differences of the two populations, dental caries rates were considered "high" for all the individuals studied, regardless of class status (Mant and Roberts 2015:197). While dental caries rates were expected to be more prevalent in women due to their increased access to foods high in sugar and carbohydrates, as well as their more limited access to high protein foods and the impact of pregnancy on their bodies, which may compromise women's immune systems (Mant and Roberts 2015:199), men and women appear to exhibit similar frequencies of caries due to men's access to higher *quantities* of foods as heads of the household. As the authors explain, "increased consumption of carcinogenic foods may explain the similar caries prevalence rates amongst the sexes found in the current research" (Mant and Roberts 2015:199). The similar rates of caries between the two cemetery populations may be rooted in England's lack of oral hygiene practices at the time as well, which generally spanned classes and genders (Mant and Roberts 2015:200).

Furthermore, while higher rates of nutritional and other developmental diseases are more prominent in the lower classes due to limited access to resources, the presence of "fashionable diseases" due to maladaptive behaviors are known to impact the wealthier members of stratified societies, as they are diseases and behaviors that are often chosen by and meant to privilege those

afflicted with them. Fashionable diseases, such as melancholy, fatigue, and nerves, specifically afflicted women and were often invisible, chronic, and not physically grotesque (Andrews and Lawlor 2017:243), allowing women to garner public sympathy and attention without fear of the social ostracization often experienced by those with severe physical disabilities during this time (Gabbard 2011:85).

The notion that women were more susceptible to illness due to their weaker bodies and minds was not only financially beneficial for the doctors treating these "diseases" but was also advantageous for middle- and upper-class women. Thus, by being afflicted, wealthy women gained social prestige and sympathy without having to worry about being inconvenienced by a disease that was debilitating or even deadly. It was largely thanks to their wealth that such afflictions could be indulged in the first place and that their lives would remain easy after diagnosis, as their lifestyles permitted constant bedrest and care at the hands of servants or maids (Andrews and Lawlor 2017:240; Lawlor 2017:362). This phenomenon is embodied by the character of Mrs. Bennet in Jane Austen's *Pride and Prejudice*. The Bennet family, who are among "the wealthier gentry living in the country" (Rosser 1967:12), fit the lifestyle that allows Mrs. Bennet's likely imaginary "disease", which afflicts her throughout the book, to have a minimal impact on the household economically, if not emotionally (Austen 1967:78). For example, Mrs. Bennet often laments the state of her "nerves" and accuses her husband, Mr. Bennet, of being callous about her suffering: "You take delight in vexing me. You have no compassion on my poor nerves" (Austen 1967:76). However, despite the emotional turmoil Mrs. Bennet frequently seems to be in due to her "condition", Mr. Bennet humorously personifies his wife's nerves as he says to her, "You mistake me, my dear. I have high respect for your nerves. They are my old friends. I have heard you mention them with consideration these last twenty

years at least" (Austen 1967:76). In the case of Mr. and Mrs. Bennet, the husband responds to the health complaints of his wife with humor and mockery while the wife considers herself tormented by her nervousness. While Mr. Bennet is considered "an odd mixture of quick parts, sarcastic humor, reserve, and caprice" (Austen 1967:77), Mrs. Bennet is perceived as "a woman of mean understanding, little information, and uncertain temper. When she was discontented, she fancied herself nervous" (Austen 1967:77). The differences between how men and women are portrayed in works such as *Pride and Prejudice* unveil the façade of invisible and fashionable diseases among the wealthy. These diseases are perceived as a tragic experience for the neurotic wife and an emotionally exhausting, if occasionally humorous, experience for the aloof husband.

Fashionable diseases, as detailed here, are invisible and, as was argued by some physicians at the time, likely fabricated for the social prestige they generated. They came in and out of fashion, especially if they permeated into the lower classes, which forced the upper classes to find new avenues of furthering their prestige (Andrews and Lawlor 2017:241; Lawlor 2017:368). Therefore, while the poor may have been forced into more dangerous occupational and lifestyle activities resulting in increased exposure to disease and trauma, the wealthy had the privilege of "choosing" at least some of the diseases that they were afflicted with. Given the invisibility of many of these diseases, they will generally not be seen archaeologically; however, fashionable diseases must be included in a discussion of gender and class differences in the study of pathologies due to the closely associated fashionable and maladaptive childrearing behaviors that were first introduced by wealthy 18th century "influencers". These behaviors, specifically, often resulted in detrimental consequences to the health of wealthy children, the most vulnerable members of the population within that status group.

The Intersection of Age and Status

Newman and Gowland (2017) examine children and infants from three post-medieval London cemeteries with the goal of identifying how class status may have contributed to differences in disease exposure, including scurvy, rickets, dental enamel hypoplasia, and periosteal new bone formation (Newman and Gowland 2017:220). The authors examined two cemeteries included in the proposed study, Chelsea Old Church, St. Benet Sherehog, and Cross Bones graveyard, which was not part of the sample analyzed for this thesis. The authors expected that children from poor backgrounds would exhibit stunted growth and higher rates of disease indicative of deficiencies (Newman and Gowland 2017:217). While Cross Bones graveyard, the poorest of the three, did exhibit "the highest rate of skeletal pathologies" as listed above (Newman and Gowland 2017:223), the population of Chelsea Old Church, the wealthiest of the cemeteries examined, also showed surprising signs of poor infant health, specifically in regard to infant growth patterns (Newman and Gotland 2017:224). The authors attribute the deficiencies found in the lower status cemeteries to a lack of resources, such as dry feeding infants with flour and water, or continuing to breastfeed children with nutritionally inadequate breastmilk to avoid more expensive weaning foods (Newman and Gowland 2017:225). However, given the surprising results from Chelsea Old Church, whose population would have had greater access to resources to feed and care for children, the authors speculate that fashionable yet maladaptive childrearing practices, including dry feeding or wet nursing, may have resulted in stunted nutritional intake in infants whose families had access to greater resources but did not desire to engage in unfashionable childrearing practices (Newman and Gowland 2017:225). It was during this time that breastfeeding was considered inappropriate for wealthy women to engage in due to considerable social pressures, including the disgust many husbands felt towards the act (Salmon

2001:260), leading to an increase in dry feeding and wet nursing infants. As a result, the health of wealthy children unnecessarily suffered *because* wealthy families had greater access to resources, which allowed them to employ wet nurses and maids to care for their children, or to feed them expensive dry diets, despite the deleterious impact this would have had on a child's health.

Furthermore, as discussed by the authors, wealthier families engaged in cultural practices that limited infant access to vitamin D, including swaddling children, prohibiting them from going outside to avoid contaminating one's moral and physical self, and due to the belief that sunlight was bad for children's eyes, which could result in stunted growth, rickets, and jaundice (Newman and Gowland 2017:225; Shortland et al. 2008:202). As with the previously discussed fashionable diseases, fashionable childrearing and childcare practices, usually established and engaged in by the wealthy, were not only chosen, but were explicitly divided along class lines. As a result of these trends, pathologies may show themselves—sometimes surprisingly—in less vulnerable groups with greater access to resources whose members opted to engage in maladaptive practices for the sake of "style" or prestige while the poor involuntarily engaged in behaviors that made them more susceptible to trauma and disease.

As has been demonstrated, class and gender as well as age can reveal the considerable social and economic impacts of trauma and disease within a population, but social factors that impact the population as a *whole* may tell a different story. However, these studies do not detract from the fact that men and women, wealthy and poor, occupied strictly socially prescribed sex and gender roles in the English Long Eighteenth Century, and these roles may be reflected in the cemetery populations targeted by the proposed study. While gender roles did change over time, as they were "contested and always under construction" (Poovey 1988:3), the division between

men and women increased in the course of the Long Eighteenth Century, further exacerbating social differentiation along labor, behavioral, and gender lines.

Masculinity and Femininity

Fatherhood in England during the 18th through 20th centuries has been of increasing interest to scholars who study the history of masculinity (Francis 2002:637). Victorian fatherhood, as it is conventionally understood, places fathers and their role in the home into three categories: the "domestic tyrant" or the grim, heavy-handed father; the "absent father" or the emotionally distant father whose primary responsibility is to "pay the bills"; and the "nursing father" or the sympathetic father in the domestic household (Tosh 1996:48). These roles, which were privileges of the wealthy, did not remain static over time, however, nor did the complementary roles of femininity and motherhood. Conceptions of masculinity and femininity and, as a result, fatherhood and motherhood, were crafted over time as perceptions of what it meant to be a man and a woman changed. These changes can be traced from the early 1800s into the late 1800s, as literature for young boys went from prioritizing the godly androgynous boy who "may well reach his greatest heights not leading cheers for the old school on the playing field but addressing his Creator from a sickbed" (Nelson 1989:526) to the rugby-playing young man, physically tough and a natural conqueror (Nelson 1989:536; Francis 2002:641).

Women, on the other hand, as mothers and caretakers, began to adopt more social roles that would come to impact the public sphere as their duty to socialize their children, boys included, impacted the father's role to masculinize and socialize their sons (Tosh 1996:55). As a result, motherhood and a woman's "natural" ability to care for and teach children helped encourage social mobility where this had previously been discouraged because women needed at least some knowledge of the public sphere to properly bring up their children into the world

(Gordon and Nair 2006:553). However, strictly defined masculine and feminine roles of fatherhood and motherhood persisted, even for the most liberal of women and domestic of men (Francis 2002:648; Gordon and Nair 2006:553).

Literary Sources of Evidence

It is also during this time that the development of the modern novel enters the area of defining cultural roles, including gender roles (Shoemaker 1998:40). Orally transmitted ideas, which would inevitably find their way into print, imbued written text with implicit perceptions of gender and gender roles (Shoemaker 1998:15). Novels, much like conduct books and medical texts, depicted gender roles and gendered behavior as they were traditionally understood (Shoemaker 1998:40). In particular, novels often depicted women holding important positions in the domestic sphere, with their roles as sentimental caregivers being virtuously deserving of celebration rather than critical scrutiny (Shoemaker 1998:42). Men, too, were depicted mainly as protectors of their children and wives, further reinforcing idealized societal notions of how masculinity should be conducted in England into the early 18th century (Shoemaker 1998:43). As explained by Poovey (1988:6), by refusing to conform to how society prescribed gender roles and norms as seen in "sermons, conduct material, and population literature", the anomalous individual became socially problematic. This thesis argues that literature, specifically the 18th and 19th century novel—which supplements the bioarchaeological and paleopathological data for this project—both created and reified ideas of how gender ideologies were constructed and performed during England's Long Eighteenth Century. In order to elucidate the goals of this thesis in relation to previously published literature, the following chapter presents pertinent scholarship on the culturalization of the human body and disease, as well as how class status, location of residence, and gender impact health.

Chapter 2: Literature Review

The Body as Material Culture

It has become widely accepted in bioarchaeological literature that the human body is the product of a wide array of cultural forces that manipulate the physical form through the actions and behaviors of individuals in a population, as well as through the impact of environmental and health stressors that play exogenous roles on the development, maintenance, and degeneration of the human body. The body is—and is a product of—culture. Specifically, the body *is* culture in a manifestly physical form in that it personifies the ways in which humans are restricted and permitted to behave within culturally created sets of identities. The many ways that the body is shaped are controlled by social pressures that exist at the intersection between a spectrum of identities that shape life experiences, including gender, sex, race, ethnicity, religious affiliation, class status, and health or disability status.

The human body is the ultimate vehicle through which these identities are performed, as culture influences these identities and how they are shaped, perceived, and acted out either within or outside the bounds of a culturally mandated sense of "normalcy". These acts, also known as "performances", as coined by gender theorist Judith Butler (Butler 1990:24-25), physically alter the body and, should the acts be repeated often enough or embody enough social power, may leave behind markers of lived experiences in death. The human body at its most structural level—the skeleton—is a plastic vessel upon which sociocultural forces are wittingly or unwittingly inscribed in all social categories. The skeleton as a form of material culture (Sofaer 2006) can be studied by the bioarchaeologist to reveal how social forces may have been conformed to or subverted by examining the lesions, pathological markers, and other evidence

left behind after a lifetime of experiences that expose individuals to various sociocultural influences.

The body as an element of culture has been discussed extensively by bioarchaeologists and archaeologists alike. As Joanna Sofaer argues in the chapter "The Body as an Archaeological Resource" in *The Body as Material Culture* (2006), the body is itself an item of analysis in archaeological and bioarchaeological research. By perceiving the body in such a way, it can be viewed as an agent that is constantly experiencing biological, sociocultural, and environmental forces which in turn can be examined through a bioarchaeological lens. Embodiment is defined by Sofaer (2006:22) as an approach that "aims to foreground the experience of the individual as part of a methodological and interpretive interest of the self". Under the influence of the New Archaeology in the 1960s and 1970s, the focus of the field shifted away from studying archaeological sites and their artifacts as separate from the bodies that created these artifacts and inhabited these spaces to recognizing the body as an artifact in and of itself that is worth studying in relation to material culture and human behavior (Sofaer 2006:14).

However, it was not until the advent of post-processual archaeology in the 1980s that social theory was applied to archaeological studies, stressing the cultural construction and relativist nature of human experience. This created a pathway for the implementation of the body as an entity that is not only biological, but social and, as a result, culturally constructed (Sofaer 2006:20). However, some in bioarchaeological discourse focus heavily on scientific paradigms that view the body as strictly biological, rejecting constructivism of the body in favor of traditional osteological methods and analyses of the skeleton, while other individuals, who are strictly constructivists, view osteological analyses of the body as "a modern western concept" that may not necessarily align with socio-historical practices across cultures and time because of

the cultural construction of science (Sofaer 2006:26). However, neither perspective is wholly correct, and by defaulting to a view that rejects biology or constructivism outright, the field of bioarchaeology will only undermine itself (Sofaer 2006:25). This thesis is situated in a third space between the mechanisms of a biological and cultural approach, in that the body is recognized as a malleable entity capable of experiencing change over time, but identifying sex and age from the skeleton to aid in analyses is viewed as a means to an end rather than an end in itself (Sofaer 2006:24). The biocultural approach to bioarchaeology, which recognizes the interconnectedness between behavior and biology (Sofaer 2013:227), is utilized in this thesis as a theoretical and methodological approach to aid in understanding how sociocultural pressures and the behaviors that accompany them may result in biological outcomes.

By utilizing a biocultural approach to bioarchaeological analysis, it is possible to understand the body as a gendered entity. Sofaer (2013:231-232) outlines the six major themes in bioarchaeological research that have played major roles in the study of sex and gender in the past, including "mortuary analysis, activity reconstruction through studies of the division of labor and occupational specialization, health and disease, stable isotope analysis of diet and human mobility, intentional body modification, and violence and warfare". While the only themes on the list that contribute to this thesis are labor, occupation, health, and disease, the author's discussion of the remaining themes demonstrates the varied approaches to the study of gender and disease in bioarchaeological research. For example, mortuary and osteological analysis can contribute to understanding non-binary identities by recognizing "systemic discrepancies between biological sex and grave goods" (Sofaer 2013:232), while stable isotope analysis can reveal the differences between diets due to culturally varied access to food resources based on gender or other variables (Sofaer 2013:234).

In regard to labor and occupation, Sofaer (2013:232) explains the methodological applications of skeletal stress modifiers, trauma, and joint changes that can reveal modifications in the body as a result of repeated behavior throughout the life course. Furthermore, the connection between gendered labor and occupation, as well as health and disease, is explicit as those engaging in certain activities on a regular basis may be more or less exposed to certain physical ailments (Sofaer 2012:233). One assumption of this thesis was that certain changes to the skeleton, including traumatic lesions, could provide clues indicating whether individuals were complying with their designated sociocultural roles as prescribed by 18th century London society or not. Were men exhibiting higher rates of occupational trauma and disease than women because they were expected to engage in physically dangerous and demanding professions as protectors of their households and families? Were women exhibiting less evidence of occupational trauma and disease because they were expected to engage in relatively safe domestic tasks in the confines of and immediately around the home? While there are limitations to understanding gendered patterns of activity with the kind of precision required to answer such questions (Sofaer 2013:232), it is nonetheless possible to reveal general patterns of gendered behavior in relation to occupation and labor based on evidence from the human skeleton. However, due to the nuances surrounding the relationship between sex and gender—specifically that of osteological sex estimation and the cultural construction of gender identities—bioarchaeologists must take care when interpreting how sex and gender should be examined and explained when conducting such research.

In bioarchaeological research, it is not considered a great leap of logic to use osteological sex estimation to understand gender because sex is believed to, more often than not, lead to presumed corollary gendered behavior (Sofaer 2013:229). However, as Sofaer (2013:229)

explains, rather than expecting a biological attribute (sex) to mark a social attribute (gender), it would be more appropriate for bioarchaeologists to investigate the importance of gendered behaviors and potential gender identities across societies to determine if sex is the main axis of identity from which gender emerges, or if gender is perceived as an identity separate from sex. By separating sex from gender during analyses, bioarchaeological research is better equipped to investigate cultures without the influence of an inherently western and heteronormative lens that maintains the *a priori* supposition that that sex maps onto gender and vice versa. This idea is explored in detail in Ghisleni et al.'s "Introduction to 'Binary Binds': Deconstructing Sex and Gender Dichotomies in Archaeological Practices" (2016). The authors argue that the binary bind, which they define as the social categorization of sex as biological and gender as cultural, forces archaeological research into a false dichotomy that is limited to a two-tiered system of sex and gender. While the social sciences, among other disciplines, are in general agreement that sex and gender are separate identities that cannot and should not be conflated (see Bittner and Goodyear-Grant 2017; Johnson et al. 2009; Willmott 1996), the binary bind argument suggests that neither the two-sex/two-gender model, nor the sex/gender system, are sufficient when it comes to understanding sex and gender outside a heteronormative and binary system. Furthermore, the binary binds argument suggests that it is not appropriate for archaeologists to assume an *a priori* understanding of past systems of sex and gender viewed through a contemporary, western lens; rather, it is by removing these groups from their "assumed interrelations, boundaries, and social effects" that sex and gender can be understood as contextual within their respective temporal and cultural realms that may not include an inherent interconnectedness between the two identities (Ghisleni et al. 2016:780). This argument does not seek to destabilize the science behind osteological sex estimation that seeks to place individuals within a category of "male" or

"female"; instead, it aims to push scholars to recognize that sex does not have to be the only point analysis in archaeological studies of the human body, as it preemptively informs further analyses when past identities may not have seen sex as a primary point of identification when formulating social identities (Ghisleni et al. 2016:771, see also Agarwal 2012:324).

This thesis begins with the assumption that it is possible to identify the performance of class and gender roles in trauma and disease profiles in the human skeleton depending on whether individuals conform or stray from their socially prescribed roles. In order to avoid the binary bind, the theory of gender performativity will be used to investigate how gender and sex are built upon discourse rather than the *a priori* assumption that they exist in transhistorical and transcultural contexts (Ghisleni et al. 2016:770). This approach is applicable to the thesis project presented here because of the implications of performativity theory for the formation of physical changes to the body as a result of socioculturally determined behavior. Gender performativity is the legitimization of gender through repeated and ongoing behaviors that reinforce sociocultural notions of gender through practice (Butler 1990:24-25). Sex, too, is seen as a product of sociocultural processes that "gains legibility through cultural interactions rather than as an ontologically prior reality" (Ghisleni et al. 2016:770). As the authors argue, this theoretical perspective challenges the two-sex model and the sex/gender system because performativity does not recognize sex and gender as biological and cultural but rather as equally constructed by culture, which removes the static nature of sex as male/female and gender as man/woman and recognizes these identities as created in their respective temporal and cultural contexts (Ghisleni et al. 2016:770).

When considering the results of this thesis, it is important to recognize the intersection of identities in the formation of the body. It can be presumed that gender, as a major point of

identity in 18th century London, would be a key element in the body's formation over the life course given the power that gender had to influence socialization and behavior during this time. However, it would be incorrect to assume that gender roles and gendered behavior always override other identities that naturally intersect with gender, such as class and socioeconomic status, race and ethnicity, or disability and health status, for example. As a result, it is necessary to consider how performances of gender, including performances that do not live up to the social standards in place, impact how gendered behavior is perceived in the body, even if performances attempt to be as stereotypically embodied in an individual as is socially expected (Joyce 2005:145). As explained by Rosalind C. Morris in her piece "All Made Up: Performance Theory and the New Anthropology of Sex and Gender" (1995), the formations of masculinity and femininity require ideal constructions, which means that all individuals experience gender inadequacy as these ideals are impossible to achieve (Morris 1995:573). It can be argued that the confluence of gender roles and socioeconomic status further serves to disrupt the idealization of masculinity and femininity related to resource access, which is impacted by class status and directly contributes to how gender are performed or resisted.

Various innovations in bioarchaeology have allowed the field to develop exponentially over the last 20 years. Knudson and Stojanowski outline the types of bioarchaeological research that have been conducted to understand the physical formations of social identities in their piece "New Directions in Bioarchaeology: Recent Contributions to the Study of Human Social Identities" (2008). The authors argue that due to recent methodological developments, bioarchaeology is now uniquely poised to study human identities because the transdisciplinary nature of the field and the close focus on historical context reveals the relationship between the formation and manipulation of identities and the human body (Knudson and Stojanowski

2008:398). Examples of these developments in bioarchaeology include improvements in estimations of age and sex from skeletal remains, the development of methodologies to estimate mortality in past populations via paleodemography, as well as improvements in biodistance analysis, biogeochemistry, isotopic analysis, and excavation techniques, specifically through the use of *anthropologie de terrain* (Knudson and Stojanowski 2008:400-408). As the authors explain, methodological developments have allowed bioarchaeology to approach a vast array of social identities in relation to health and disease, gender, age and the life course, body modification, embodiment, and community identities (Knudson and Stojanowski 2008:408-412).

Of particular interest to the current study is the authors' discussion of social identities as reflected in health, gender, and age. As social identity is impacted by health and disease, it is argued that the study of health can reveal how occupations, gender identities, and status can affect wellbeing (Knudson and Stojanowski 2008:409). The culture of health and disease in relation to how a society views a particular disease has the potential to impact how afflicted individuals are treated through life via "hierarchical, social, and economic roles" (Knudson and Stojanowski 2008:408). The current study therefore should reveal traumatic and pathological patterns that can be tied to occupational and social roles by gender. Furthermore, the authors argue that bioarchaeology's connection to skeletal sex estimation positions the field to explore gender roles and behavior by elucidating the link between sex and gender (Knudson and Stojanowski 2009:409). While this study is not advocating the conflation of sex and gender, bioarchaeological methods and theories can be applied to provide information on skeletal sex estimation which, when discussed in relation to pathological and traumatic lesions conventionally associated with certain social roles in a study sample can reveal how gendered behavior and gender roles were being performed individually while being enforced socially.

Lastly, the authors' discussion of age sheds light on the role of the life course in such analyses, which argues for "the importance of contextualizing the physical life cycle" (Knudson and Stojanowski 2008:411). By differentiating between biological age, developmental age, and social age, it is possible for bioarchaeologists to recognize the sociocultural construction of age in relation to a particular culture. When coupled with life course theory, the bioarchaeological study of age, gender, class, and disease creates the opportunity to explore a wide variety of themes and topics related to social roles and identities that impact the human body throughout life.

Life course theory in the bioarchaeological literature is defined as the malleability of the body and its construction over time (Agarwal 2012:324). Sabrina C. Agarwal in "Bone Morphologies and Histories: Life Course Approaches in Bioarchaeology" points out that bioarchaeological research has the potential to use bone morphology to study the life course of individuals and entire communities (Agarwal 2016:131). Life course theory studies "individual lives and their connection to their historical and socioeconomic contexts" (Agarwal 2016:131). The application of life course theory to bioarchaeology emphasizes the plasticity of the body and the trajectory of experiences that the body takes throughout the life course. Plasticity, as defined by Agarwal (2016:132), is "the ability of an organism to change its phenotype in response to changes in the environment", and has been used to explore stress, recovery, and growth. Coupled with plasticity and the life course is the experience of embodiment, or "how beings literally incorporate the world in which they exist biologically, including social and ecological variables" (Agarwal 2016:132). Embodiment is used as one of the theoretical underpinnings of the current thesis, because the goal of this piece is to understand how gendered and socioeconomic experiences in life may be revealed in the human skeleton over the life course, and if these

experiences can reveal differences between strictly enforced and performative sociocultural categories of gender and class.

Health and Disease

Paleopathology has been studied extensively in bioarchaeology. The social aspect of bioarchaeological research coincides with the study of health and disease due to the influence of sociocultural and environmental stressors on health. Paleopathology did not develop alongside bioarchaeology—rather, the field's origin in the 18th century was a result of anatomists and physicians studying the differences between "normal" and "diseased" states of the human body (Grauer 2017:904). However, by utilizing theoretical approaches common in bioarchaeology in combination with paleopathological methods, the two fields have been able to make use of biocultural paradigms to stress social theory in the study of disease (Buzon 2012:60). Bioarchaeology's integration of paleopathology is not the only influence the field has had on the use of multidisciplinary approaches; rather, paleopathology's application of methods and theories from other fields has provided the field with the opportunity to grow. Given the abundant use of multidisciplinary approaches in this thesis, the following review will discuss scholarship that applies the use of theories and methods from other fields to paleopathology, such as epigenetics, epidemiology, and bioarchaeology, to understand how multidisciplinary approaches have continued to influence and develop the field.

Interdisciplinary Approaches to Paleopathology in Bioarchaeology

The applicability of life experiences to bioarchaeological research has been emphasized by Roksandic and Armstrong (2011) and Gowland (2015) as well as other scholars. In Roksandic and Armstrong's "Using the Life History Model to Set the Stage(s) of Growth and Senescence in

Bioarchaeology and Paleodemography" (2011), the authors discuss how life history theory, which is used to study how "trade-offs between growth, reproduction, and maintenance" interact with behavior (Roksandic and Armstrong 2011:340), can discern milestones throughout the stages of development and degeneration to estimate life stages rather than chronological age. This method can be used to compare the growth, development, and senescence of archaeological populations. While the authors of this piece are using a theory rooted in evolutionary thought to explore life stages, it is argued that the application of the life history model, when used in bioarchaeological contexts, can form a bridge between paleodemographic and bioarchaeological research, resulting in more reliable age estimates. The application of life history in relation to the life course, however, is present in the study of the struggles that individuals and populations may face in early life, specifically in relation to how the skeleton experiences bouts of fragility due to "nutritional stress, physical activity, and reproduction" and potentially overcomes these hardships (Agarwal 2016:140).

In Rebecca Gowland's "Entangled Lives: Implications of the Developmental Origins of Health and Disease Hypothesis for Bioarchaeology and the Life Course" (2015), the author explores life course theory as it impacts the skeleton starting in early life, specifically in relation to the Developmental Origins of Health and Disease (DOHaD), which is defined as the impact of "poor care, nutritional, and environmental circumstances, adversely affecting developmental trajectories" of individuals in childhood (Gowland 2015:530). This hypothesis is directly tied into the idea of phenotypical plasticity, as discussed above, which is defined as the changes that the body experiences from environmental, behavioral, and "culturally induced exposures" (Gowland 2015:530). Gowland (2015:531) argues that bioarchaeology requires a greater

emphasis on life course theory, specifically in relation to intergenerational adversity when studying health, and that DOHaD can serve as a means of understanding this issue.

The DOHaD hypothesis has been used for epidemiological investigations of early life stressors to understand how archaeological populations experienced and coped with their adversities. Malnutrition, for example, has been studied extensively using DOHaD in archaeological contexts given the high prevalence of pathologies indicative of nutritional stressors found in children, examples of which include enamel hypoplasia and stunted long bone growth (Gowland 2015:532). As the author argues, the connection between mother and child is of particular interest for understanding malnutrition with DOHaD, as research has revealed the socioeconomic experiences of the mother in childhood may have a considerable impact on the health and wellbeing of the child. An example of DOHaD and phenotypical plasticity is the presence of nutritional deficiencies in children, which can be indicative of a lack of resources during a woman's pregnancy if she is of a lower socioeconomic status. The DOHaD hypothesis argues that a woman's lower socioeconomic status when carrying a child will have a direct impact on the development of the fetus, resulting in the expression of a woman's class status in the body of the child when it is born (Gowland 2015:533). However, as the author argues, the current model of social bioarchaeology is not fully compatible with the DOHaD hypothesis. The DOHaD hypothesis primarily focuses on the passing down of intergenerational traits related to health while bioarchaeological models, which focus largely on life course theory, prioritize the "entanglement" of the "social and material environment" in which the body resides *alongside* evolutionary and intergenerational influences (Gowland 2015:537). The DOHaD hypothesis does, however, provide bioarchaeologists with the opportunity to explore the impact of deleterious intergenerational influences, such as the notion that the poorest are often the sickest

while the wealthiest are more likely to be the healthiest due to differential access to resources present in stratified societies. However, as Gowland (2015:537) concludes, it is important to recognize the wide variety of influences that impact human health over time, such as material, social, and physical environments, behaviors, and social roles, not just what is passed down from previous generations.

As discussed by Anne L. Grauer in "Paleopathology: From Bones to Social Behavior" (2019), the history of paleopathology has evolved away from anatomists studying the human skeleton without historical or cultural context to intertwining disease with ecological and cultural forces pertinent to the relevant sociohistorical and archaeological contexts (Grauer 2019:449). In order to do this, the author argues that the field needs less descriptivism of human skeletal remains and their pathologies and more application of social theory to reconstructions of human identity in relation to health (Grauer 2019:449, 457). Examples include feminist and queer theory, disability theory, life course theory, socioeconomic theory, human agency, and gender theory, the latter four of which are applied in this thesis specifically to understand the implications of pre- and proscribed economic and gender roles in relation to health and disease. Each of these theories focuses on how sociocultural forces can shape and impact the human body in ways that reveal the power the social world has on health.

The author closes this piece by arguing that paleopathology can continue to benefit applications of social theory because social bioarchaeology is meant to place archaeological populations into their sociohistorical contexts (Grauer 2019:457). By continuing to use the aforementioned theories, including theories from other disciplines such as the previously mentioned Development Origins of Health and Disease Hypothesis (DOHaD), the bioarchaeological study of paleopathology can reveal how behavior impacts the human body

(Grayer 2019:457-458). For example, both Grauer (2019) and Gowland (2015) argue that epigenetic approaches to paleopathology are necessary to better understand how sociocultural, material, environmental, and evolutionary stressors impact the wellbeing of populations (Gowland 2015:537; Grauer 2019:458). By accounting for how the body is literally saturated with experiences resulting from generations of direct and indirect exposure to stressors, as well as hereditary advantages and disadvantages, bioarchaeology can be better equipped to understand health and disease in past populations.

Bioarchaeology's implementation of theories and methods from other disciplines contributes directly to the exponential growth the field has seen over the past 20 years (Klaus 2014:294), particularly in regard to the study of health and disease. Laurie J. Reitsema and Britney Kyle McIlvaine outline this key issue in their piece "Reconciling 'Stress' and 'Health' in Physical Anthropology: What Can Bioarchaeologists Learn from the Other Subdisciplines?" (2014). While this piece is primarily used to introduce a symposium on the bioarchaeological study of stress and health, the authors also discuss how bioarchaeology is poised to study health through its application of methods and theories from other anthropological subdisciplines, such as primatology and ethnography. Examples of these methods include molecular analysis to understand how DNA methylation between a mother and child can impact poor health in individuals born to mothers with poor maternal care, as seen in studies of rhesus macaques, and ethnographic studies that examine how the spread of infection is not necessarily tied to poor nutritional status or location of inhabitance in relation to more modernized, crowded areas—where one would expect infections to spread quickly—but is more prevalent in rural, traditional areas where it is often expected that infections and diseases will spread more slowly (Reitsema and McIlvaine 2014:182-183).

A more recent study by Snoddy, Buckley, and Halcrow, entitled "More than Metabolic: Considering the Broader Paleoepidemiological Impact of Vitamin D Deficiency in Bioarchaeology" (2016) poses a similar argument to Klaus (2014). They suggest that certain epigenetic effects are generally invisible in the bioarchaeological record, but by studying certain biological responses—specifically those pertaining to vitamin D deficiency—researchers can more effectively apply "clinical thought regarding epigenetic effects to the discussion of ancient health and disease" (Snoddy et al. 2016:192). By using life course theory, for example, the paleoepidemiological study of rickets can be interpreted through the lens of socioeconomic class *and* physiological processes that occur on a cellular level. The authors use the actions of vitamin D receptors (VDR), which facilitate physiological processes when activated, such as the lack of innate immunity against opportunistic infections in individuals with vitamin D deficiencies, and an increase in autoimmune diseases and cancers for individuals with vitamin D deficiencies, to understand the presence of co-morbidities that are invisible in the archaeological record when studying rickets and osteomalacia, conditions that also result from vitamin D deficiencies but are more visible archaeologically. As the authors argue, clinical scientists do not experience the same restrictions that bioarchaeologists face when studying the impact of vitamin D deficiencies on the human body; however, by understanding the cellular impact of vitamin D deficiency, bioarchaeologists are better positioned to create new interpretive models that recognize the limitations of bioarchaeological research into vitamin D deficiency based on clinical research in living individuals and populations (Snoddy et al. 2016:189).

Similar sentiments were echoed by Zuckerman et al. in the piece "Adapt or Die: Three Case Studies in Which the Failure to Adopt Advances from Other Fields has Compromised Paleopathology" (2016). As the authors explain, major problems are currently holding the field

of paleopathology back due to resistance to adopting advances from other scientific fields (Zuckerman et al. 2016:375). Three reasons are proposed to explain why paleopathology is failing and what methodological approaches can be used to improve the field. The first topic is the issue of differential diagnoses and lack of clarity and criteria when proposing diagnoses, as seen in the case of syphilis and the debate surrounding its origin. As the authors explain, issues with data presentation and lack of standardization in diagnosing syphilis have further inflamed the issue of whether syphilis originated in the New World or the Old World; because of this, the authors propose that epidemiological approaches, which are used in clinical diagnostic research, should be used to weigh the probability of a disease showing indicator signs of the condition versus failing to show these signs, based on statistical and osteological methods that have been generated to estimate these frequencies in skeletal samples (Zuckerman et al. 2016:376).

Gender, Class, and Health

The intersection of health and gender reveals how the cultural constructs of identity impact power relations, resource accessibility, economic inequalities, and behavioral and occupational roles. As a result of these divisions, the health and wellness of certain groups are influenced by culturally mandated gender roles and identities that dictate the behaviors, resource access, and power relations of those groups to conform to idealized gender norms. It is through these gender norms that the health of women and men are affected in varying ways and, in the case of 18th century England, the focus of this thesis, these impacts align with contemporary Western gender norms that suggest the roles of men and women are diametrically opposed to one another. Men and women have traditionally been placed in what is now considered to be stereotypical opposition to one another in regard to their behavior in western cultural contexts. As a result of this division, men and women are expected to experience different types of risks

and hazards throughout their lives as they are not living in the same gendered worlds (Phillips 2005:2). This review discusses how gendered behavior and health have been explored in bioarchaeological, paleopathological, and medical literature with the goal of understanding how studies have revealed how conforming to socially mandated gender roles differentially impacts the health and wellness of men and women.

The human body is shaped by biological, social, cultural, environmental, and genetic experiences. Because of this, health, wellness, and the diseased and injured state are all intertwined with these experiences. As explained by Zuckerman and Crandall in "Reconsidering Sex and Gender in Relation to Health and Disease in Bioarchaeology" (2019), the authors argue that bioarchaeology is uniquely positioned to study the construction of health and disease in relation to social identity because of the advancements made in second and third wave feminist theory that recognize the differences between sex and gender, as well as intersectionality and performance theory, respectively (Zuckerman and Crandall 2019:162). Five approaches using sex and gender in bioarchaeology are outlined by the authors, two of which are applied in this thesis. The first approach recognizes sex and gender as culturally constructed while the second focuses on the plasticity of the body and the phenotypical changes it undergoes throughout the life course (Zuckerman and Crandall 2019:163). Although the first approach questions the validity of skeletal sex estimation (Zuckerman and Crandall 2019:163), this thesis will argue that while morphological methods to estimate sex can be problematic if used in a way that leads to biased interpretations, such as using sex to explain every social, cultural, biological, and environmental aspect of an individual, it is necessary to recognize how skeletal sex estimation is an invaluable tool that contributes to bioarchaeological research. The second approach, plasticity, has been explained thoroughly throughout this review. By using these two approaches, this

theory recognizes the human body as an entity that is culturally constructed and constantly changing while also being influenced by biological and environmental factors. While the identities of sex and gender, specifically, are considered culturally constructed, the osteological methods through which sex is estimated serve to inform the researcher's perspective when reconstructing past identities rather than being a primary viewpoint from which further data are extrapolated.

When marrying sex and gender with health and disease, it is possible to see how cultural norms and biological processes can impact the health of the human body. As explained by Zuckerman and Crandall (2019:165), gender systems are placed within hierarchies that affect relations between gendered behavior, occupations, and resource access as a result of societal systems that dictate how these relations are formed, distributed, and reinforced. For example, women tend to have less access to resources and are in poorer health due to inadequate nutrition compared to men and are often the victims of political and culturally sanctioned violence (Zuckerman and Crandall 2019:165). As a result of this, the impact of gender hierarchies on women and men is a biosocial one—the body is impacted by systemic structures just as much as society as a whole is impacted by the power of gender categories.

Osteoporosis, one of the most prevalent pathological conditions in the study sample, has been examined closely in the scholarly literature to understand how sociocultural forces, specifically those of gender roles and identities, as well as biological processes, have influenced the human body. Osteoporosis is defined as a "systemic skeletal disease that is characterized by such a significant reduction in bone mass and/or deterioration of the microstructure of bone tissue, that there is a consequent increase in bone fragility and susceptibility to fracture" (Agarwal 2019:388). While the perception of osteoporosis has changed in the medical sciences

to encapsulate not just general bone loss, which is now referred to as osteopenia, but rather post-menopausal osteoporosis and age-related or senile osteoporosis, it is argued that even these categories are not sufficient to explain the etiology surrounding the onset of bone mass loss and resorption (Agarwal 2019:388; Curate 2014:120). This is primarily due to osteoporosis's association as a "female" condition due to the impact that menopause has on the female body as the decline in estrogen production facilitates an increased frequency in fractures (Agarwal 2019:389). However, by failing to acknowledge the ways in which men, too, are impacted by osteoporosis, as well as the plethora of other influences that can affect bone density such as diet, occupation, genetics, and physical activity, body weight, and bone mass (Agarwal 2019:389; Fausto-Sterling 2005:1499; Weiss 2014:49), bioarchaeologists will not be able to sufficiently account for the many circumstances surrounding osteoporosis in past populations across a variety of groups due to gender bias. Expecting osteoporosis to appear in individuals who are estimated to be female via skeletal sex methods prefigures the observations of the researcher. However, for individuals who are estimated to be male or indeterminate, osteoporosis may not appear as frequently. The bias in the eyes of the researchers will influence the association of certain conditions with a particular group in the population. Given the consensus regarding osteoporosis's proclivity toward being identified in female-bodied individuals, it is necessary to explore how this condition can be viewed more critically so as to avoid erasing or neglecting the presence of pathological conditions—and thus data on the social lives of past peoples—in other groups where a condition is not stereotypically expected to occur.

In "The Past of Sex, Gender, and Health: Bioarchaeology of the Aging Skeleton" by Sabrina C. Agarwal (2012), the author uses osteoporosis to understand how the bioarchaeological study of sex and gender can challenge traditional interpretations of bone loss

and degeneration. Agarwal's (2012) case study is drawn from three medieval English cemetery samples — Wharram Percy, a rural village, as well as St. Nicholas Shambles and the East Smithfield Black Death cemetery, two urban cemeteries located in the City of London. The individuals presented in the case study were both male and female. The goal of this case study was to "explore the role of life experiences in sex- and age-related bone loss and aging" (Agarwal 2012:325), which is in stark contrast to previous bioarchaeological studies of osteoporosis that isolate female samples from male samples under the assumption that females will show the most significant bone loss, resulting in the elimination of understanding osteoporosis from a holistic gendered perspective by opting for a presumptive one. The author concluded that sex should only be considered separately if it can be shown to have a statistically significant impact on bone loss (Agarwal 2012:326).

By assessing changes in trabecular bone microstructure via X-ray imaging and image analysis, as well as ANOVA statistical analyses, the author concluded that while there was a statistically significant difference based on age categories in bone loss in the rural population, there was no significant difference in bone loss between males and females, and neither age nor sex taken together were significant. In the urban populations, however, sex and age separately were statistically significant when accounting for bone loss, with females showing the most change in trabecular bone in the oldest members of the populations compared to males (Agarwal 2012:326). Agarwal (2012:327) concluded that what was seen in the rural population of Wharram Percy— where sex did not demonstrate a statistically significant impact on bone loss— is contrary to what would be expected based on biomedical research and the menopause paradigm. Biosocial explanations of the differences seen in these populations, such as shared diets of low nutritional value between men and women in rural populations, suggest that seasonal

stress and malnutrition, and hard labor and occupational stress may have contributed to a mutual degradation in trabecular bone in both sexes (Agarwal 2012:327-329). The urban populations, however, may have had greater access to fresh foods via markets and better living conditions, albeit still being plagued with disease and nutritional stress (Agarwal 2012:328). This argument posed by the author, however, contradicts the general consensus that urban living posed a far greater threat to the health of populations due to overcrowding, smog and pollution, lack of public sanitation, and the rampant spread of disease (DeWitte et al. 2016:241; Newman and Gowland 2016:217). Additionally, class status was not taken into account when analyzing the three cemeteries, which means that access to resources could have disproportionately impacted the diets of individuals, as well as occupational roles, resulting in variations in bone loss between the populations.

Another study by Agarwal looks at osteoporosis in the prehistoric population of Çatalhöyük, a Neolithic settlement in Anatolia. In Agarwal's contribution to *Exploring Sex and Gender in Bioarchaeology* (2012), the chapter "Understanding Sex- and Gender-Related Patterns of Bone Loss and Health in the Past" examines the presence of bone loss in the ribs and metacarpals of two groups of 57 and 49 individuals, respectively, with the goal of understanding "sex-related patterns of bone turnover and loss that are relevant to the discussion of gendered life at Çatalhöyük" (Agarwal 2012:173). When studying the presence of bone loss in ribs, thin sections were taken from a midthoracic rib and processed via microscopy and static imaging to measure the area of the entire bone, as well as the cortical bone area (Agarwal 2012:174). The cortical index was then calculated using the total bone area and the cortical area. The ribs studied suggested that females lost bone by the time they reached middle age (30-49 years), while males lost bone by old age (50+ years); by old age for both sexes, however, bone loss had equalized

and no sex differences were significantly present, which the author suggests may indicate that men and women shared health- and activity-related behaviors (Agarwal 2012:176). The study of metacarpals presents patterns akin to contemporary populations—the cortical thickness and cortical index of metacarpals from 49 individuals indicates that there are few significant differences between the sexes in the oldest age group (50+ years), but females in the previous age groups (20-29 years and 30-49 years) show lower amounts of bone via the calculation of the cortical index compared to males (Agarwal 2012:177-178). Agarwal (2012:179) suggests that reproductive stress in women may have been the primary contributor to differences in bone mass in the young and middle age groups, and that a general lack of gendered activities can explain why cortical bone evened out between the sexes in the oldest age group.

As this study demonstrates, studying populations where strict gendered behavior and labor do not seem present but differences in health appear to stem from biosocial behaviors, such as pregnancy, lactation, and menopause in women, new models of studying health and disease in the skeleton allow us to pose more complex questions. Being able to recognize one aspect of social behavior as equally represented across a population provides researchers with greater opportunities to understand other ways that society could have been divided. As will be seen in the remainder of this review, similarities in the health of individuals based on sex may actually provide insight into how the structuring of class status and location of habitation may influence how people behaved, what labor they engaged in, and the social norms they felt compelled, or required, to conform to.

In a study by Simon Mays titled "Age-Dependent Cortical Bone Loss in Women from 18th and Early 19th Century London" (2000), the author also uses a cemetery from London, specifically Christ Church, Spitalfields, to examine the "total bone width, medullary width,

cortical thickness, cortical index, total area, medullary area, cortical area, and percent cortical area" of metacarpals via radiogrammetry from 95 individuals, aged 17-94 (Mays 2000:352). Using linear regression, the study estimated age-dependent bone loss in females. The variation in bone loss between the variables suggests that there was a 5:1 loss of bone to gain, resulting in a "net thinning of cortical bone with age" for women 45 years of age and older (Mays 2000:356). Poor nutrition in childhood may have impacted endosteal surface bone growth while allowing for periosteal bone to develop and be maintained; as a result of this, women in the Spitalfields cemetery would have experienced greater thinning of cortical bone in older age (Mays 2000:357-358). This is also in line with general trends in adolescent samples from the Spitalfields cemetery who showed signs of poor nutrition and health, such as cribra orbitalia and stunted long bone growth (Mays 2000:358).

Mays performed another study on osteoporosis in men from the same cemetery and time period. This piece, entitled "Effect of Age and Occupation on Cortical Bone in a Group of 18th-19th Century British Men" (2001), examines the metacarpals via radiogrammetry of 91 male individuals between the ages 18-92. The measurements taken included bone length and width, medullary cavity width, cortical thickness, cortical index, anterior-posterior total bone width, and anterior-posterior medullary width. The results of this study suggested a steady increase in bone width throughout adulthood but a decline in cortical bone index for individuals 40 years and older, with a 2:1 loss of endosteal bone to subperiosteal gain (Mays 2001:39). The author argues that occupation may have been a major contributing factor in bone loss over time, as several of the individuals studied were weavers, craftsmen, laborers, and merchants (Mays 2001:38). As with the previous study by Mays (2000), it is also argued that poor childhood nutrition may have resulted in cortical thickness decrease in adult life.

While osteoporosis is considered a "female" condition in clinical literature, both studies by Mays (2000, 2001) demonstrate that osteoporosis is influenced by more than just biological predisposition. However, the paleopathological literature has shown trends among certain groups and skeletal conditions, such as hyperostosis frontalis interna (HFI), which appears to be a more common affliction in females than males. As this review demonstrates, understanding how certain pathological conditions disproportionately impact certain groups more than others allows us to explore how patterns found in literature— and the explanations behind these patterns— may relate to the results of a biocultural mortuary analysis like the one presented in this thesis.

Evidence of trauma was widespread in the study sample. Examples include healed fractures, pathological fractures, unhealed atrophic non-union fractures, unhealed hypertrophic non-union fractures, spondylolysis, and vertebral compression fractures, as well as blunt force trauma, accidental traumatic injury, surgical trauma, and soft tissue trauma. While there are problems with identifying how a trauma may have occurred due to analytical inclinations that may prefer certain, more dramatic types of causes than others (Weiss 2009:67), trauma can be a highly useful tool in reconstructing the ways in which past peoples lived due to the physical, social, and cultural implications surrounding the infliction of trauma (Lovell and Grauer 2019:335). For example, the differences in the risk of trauma and injury may vary according to "subsistence activities, technology, and occupation" (Lovell and Grauer 2019:370), as well as the location of populations being studied, such as urban versus rural areas, providing insight into how traumatic injuries were inflicted. As explained by Lovell and Grauer,

> Rural environments and agricultural subsistence expose inhabitants to trauma from animals, machinery, and falls, while urban environments injury associated with manufacturing and tension derived from overcrowding are common (2019:370).

A study by Judd and Roberts (1999) examines fracture trauma of long bones from the British farming village of Raunds Furnells, which was occupied between the late 6th to 15th centuries AD (Judd and Roberts 1999:230-231). Data from an additional rural farming village was compared to the primary sample in this study, as well as three urban cemetery samples from the same time period. The goal of this piece was to determine if there are "significant differences in frequencies and patterns of long bone fracture trauma observed between rural and urban activity bases" that may suggest the activities associated with farming are "particularly dangerous" in comparison to urban occupations and lifestyles (Judd and Roberts 1999:229). Out of the 363 burials excavated from Raunds Furnells 170 individuals were included in the study. Radiographic and macroscopic methods were used to document the type of fractures present, as well as the site and position of the bones affected. Chi-squared and Yate's correction were then used to determine statistical significance ($p \leq 0.05$) in fractures between males and females, fracture location, and site location. Males tended to have more fractured clavicles than females (40.9% to 17.6%), followed by the fibula (22.7% in males vs. 5.9% in females). For females, the primary location of fractures was in the ulna and radius at 35.3% compared to 9.1% in males. While there was no statistical significance between sex and fracture location, there was a difference between sex and forearm fractures (Judd and Roberts 1999:233).

When compared to the other rural and urban sites, there was a statistically significant difference between the urban and rural sites; specifically, females and males from the rural populations had significantly more fractures than those in urban populations. The authors suggest that different types of labor associated with urban and rural living may have contributed to the differences between fracture frequencies between both the sexes and habitation locations. For example, rural men were expected to handle hard labor around the farm, such as "fieldwork,

plowing, transporting, fishing, tree felling, and herding" while females handled chores in and immediately around the home, such as gardening and weeding, as well as baking, spinning and weaving, and caring for children (Judd and Roberts 1999:237). Urban males and females, on the other hand, would have been involved in far more sedentary jobs, such as cooking, milling, and carpentry for males and brewing, sewing, and selling foods for females (Judd and Roberts 1999:241). The physical labor involved in rural occupations far outweighs the physical labor in urban occupations, potentially impacting the outcomes of this study.

A shortcoming of the Judd and Roberts (1999) study is the failure to mention how domestic violence and gendered abuse may have contributed to the appearance of trauma on the individuals studied. While domestic violence usually disproportionately affects women (Allen et al. 2007:802), neglecting the possibility of domestic violence in men causes researchers to not "see" trauma associated with domestic violence in that demographic (Redfern 2017:27). While intentional violence, such as domestic violence, is often seen on the face and head as well as the forearms, which are often used to defend oneself from attacks (Weiss 2009:69), studies have shown that the appearance of domestic violence is not as clear-cut as it is often assumed. By categorizing domestic violence as a primarily female experience, not only are gender stereotypes being played into, but women's violence becomes private and thus stripped of political meaning compared to men's violence, which is often associated with social meaning and political consequence, such as warfare (Novak 2017:130-131).

A literature review by Redfern (2017) explores the complexities of identifying domestic violence abuse in archaeological contexts as compared to clinical contexts. As the author argues, contemporary data on domestic violence are skewed and unreliable due to financial, personal, social, and psychological hurdles that may prevent or discourage women from seeking help in

cases of domestic abuse (Redfern 2017:16-17). Furthermore, studies that attempt to secure information from survivors of domestic abuse often result in biased or limited data and results due to the reliance on self-reporting (Redfern 2017:17). Global studies of domestic abuse also suggest that women, specifically younger and middle-aged women, tend to be the primary victims of domestic violence, which is reflected in archaeological case studies (Redfern 2017:17-18). However, neglecting to study the elderly when examining domestic violence, as well as the difficulty of differentiating between domestic violence and elderly violence has hindered our understanding of the topic (Redfern 2017:18).

Redfern's study was based on nine cemeteries from post-medieval England, including two of the cemeteries analyzed in this thesis (Chelsea Old Church and St. Bride's Lower), to detail the predominant locations of injuries to women in these populations whose ages range from 18 to 45 and up. The summary indicates that the "ribs, vertebrae, lower arm and lower leg" were the areas of the body predominantly injured; the youngest women in the sample, those 18-25, were the age group least affected, which contrasts greatly with contemporary clinical literature (Redfern 2017:21). Many of the injuries reported are believed to have non-domestic violence origins. Two of the twelve women in the sample who show signs of facial injuries are believed to have received such trauma from non-violent accidents, while one woman does show greater indisputable signs of domestic violence as her trauma consists of a healed mandible, tooth loss, and frontal bone fractures (Redfern 2017:26). Clearly the associations around domestic violence, including the identity of the perpetrator and the victim, and what this violence looks like, is not as simple as the appearance of the trauma; rather, the intersections of socioeconomic status, ability or disability, psychological and mental health, and the biases

present in the researchers themselves affect interpretations of domestic violence in archaeological contexts.

However, recognizing the complicated nature of abuse makes it easier to decipher what is not abuse, as demonstrated in a study by Allen et al. (2007), which seeks to differentiate between trauma due to abuse and trauma due to accidents. A sample of 172 females who were treated for domestic assault at the Bradford Royal Infirmary between February 1997 and October 1997 were included in this study. While this sample is strictly modern, it presents an important examination of the location of abuse on the body by comparing files from 475 women also admitted to the infirmary for non-abuse accidents. In order to perform the analyses, 54 zones were identified on the human body that relate to the skeletal structure; for example, Zone 1 contains the nose and nasals while Zone 34 contains the hands. Of these 54 zones, 10 loci were identified and clustered, such as Zones 1-9 which consist of the entirety of the face. By using stepwise logical regression, the authors were able to discern two clusters of injury locations: the head, neck, and torso—likely to be locations of abuse—as well as the arms and legs, which are more likely to be the locations of accidental trauma (Allen et al. 2007:808-809). As the authors argue, age and location of injury are considered the most reliable and significant ways to identify abuse, with abuse being less frequent in older women, potentially because the elderly "age out" of abuse via death, divorce, or a decrease in the physical aggression of partners (Allen et al. 2007:811). While the model created and demonstrated in this piece was based on contemporary samples and while the affected age groups are reversed compared to the Redfern study of archaeological sites (2017:21), the data generated in the Allen et al. (2007) study can be used as a comparandum to archaeological populations in order to determine if there are similarities in the location of abuse and why such locational patterns may occur.

Summary

The goal of this literature review was to demonstrate how recent bioarchaeological and paleopathological research has focused on the notion that the body is a manifestation of culture and lived experiences, as well as to outline how case studies pertaining to the study of disease and gender in paleopathological and bioarchaeological research can shed light on what has been examined, what can be explored, and what has contributed to the analytical approach developed in this thesis.

Chapter 3: Materials and Sources

The Cemeteries and Literary Sources

Three cemetery populations in post-medieval London were analyzed in this thesis: Chelsea Old Church, St. Benet Sherehog, and St. Bride's Lower (Figure 3.1).

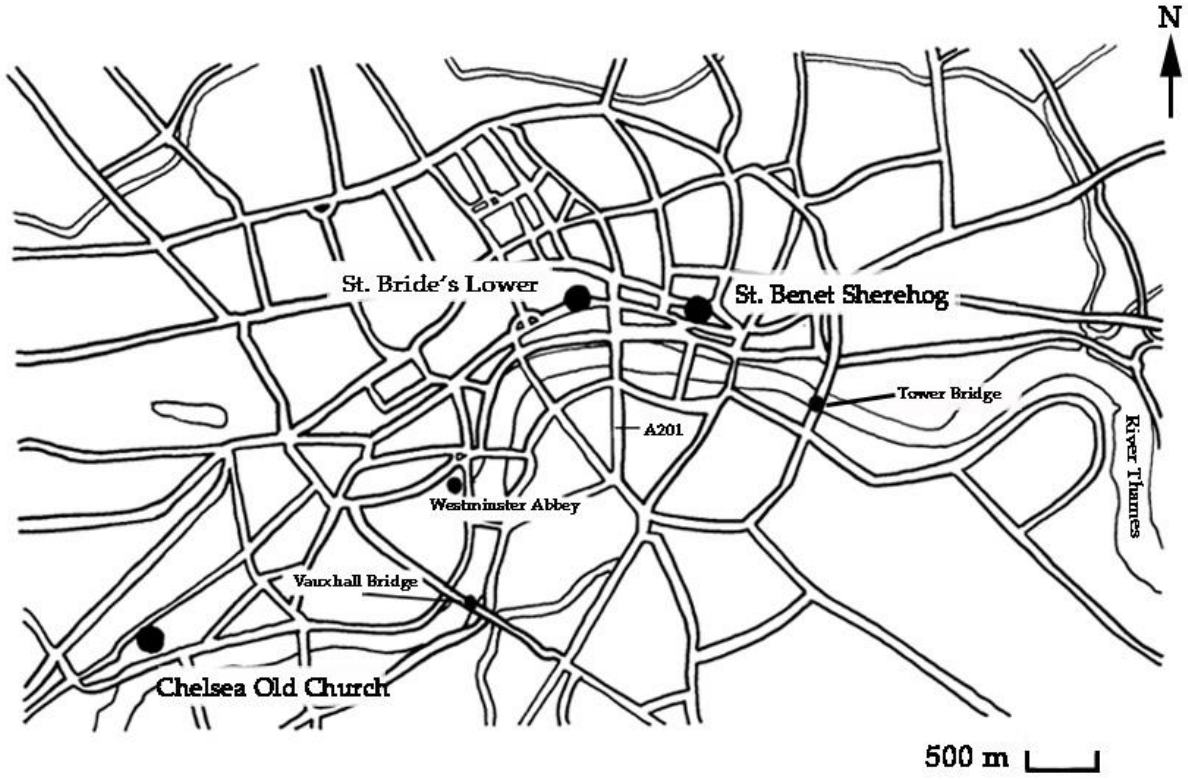

Figure 3.1: Location of cemeteries included in the study.

The cemeteries are separated from one another geographically and socioeconomically within the City of London. Pathological data were accessed through the Museum of London Archaeology (MoLA) Centre for Human Bioarchaeology's Wellcome Osteological Research Database (hereafter referred to as WORD). The goal of WORD is to "make the recording of whole human skeletons into the database as quick and accurate as possible, and to ensure that data are held within a simple data structure" (Connell and Rauxloh n.d:2). This is to allow data

"to be easily queried for research and curation purposes" (WORD database, 2018). This database was chosen for this thesis due to its accessibility and efforts by the Centre of Human Bioarchaeology to encourage scholars to use its open source data to conduct research and contribute to the growing wealth of information on London archaeology. The details provided by WORD made this an ideal data base for the purposes of this thesis. For example, the manual released by WORD entitled *Human Osteology Method Statement*, edited by Powers (2012), elaborates on the data provided in the database, including the methods used to measure osteological lesions, sex, age at death, ancestry, and stature performed by the scientists affiliated with MoLA and WORD.

Another document supplementing the database is entitled *A Rapid Method for Recording Human Skeletal Data* by Connell and Rauxloh (n.d). This document explains the unique codes used throughout the database, including the degree of bone preservation (1 = good condition to 3 = poor condition), the absence (0) and presence (1) of bones as well as codes specific to certain ailments and lesions such as osteophytes (on a scale of 1 to 3, 1 = intermittent presence of lipping on the vertebrae and 3 = extensive lipping). The shorthand used in WORD facilitated access and visual simplicity, with *A Rapid Method for Recording Human Skeletal Data* providing an in-depth explanation of the codes and interpretations present in the database.

Chelsea Old Church

During excavations in 2000, a total of 290 burials were unearthed in London from the Old Church Street churchyard in Chelsea (Cowie et al. 2008:21) (Table 3.1). Of these, 198 individuals were logged in the WORD database: 165 adults (75 female, 77 male, 13 unsexed) and 33 unsexed subadults. In the following study only adults for whom sex identification was

determined were included; this criterion was also applied to the cemetery populations of St. Benet Sherehog and St. Bride's Lower.

Table 3.1 Chelsea Old Church Cemetery Totals

Subadults	No Sex Available		% of Total Individuals	
Perinatal	3		1.5	
1-6 Months	5		2.5	
7-11 Months	1		0.5	
1-5 Years	13		6.5	
6-11 Years	5		2.5	
12-17 Years	3		1.5	
Unknown Age	3		1.5	
Subadult Totals	33		16.5	
Adults	Male	% of Total Individuals	Female	% of Total Individuals
18-25 Years	5	2.5	9	4.5
26-35 Years	9	4.5	7	3.5
36-45 Years	25	12.7	18	9
>46 Years	35	17.7	36	18.1
Unknown Age	3	1.5	5	2.5
Adult Totals	77	39	75	37.7
Complete Totals (13 Unknown Sex)	198 Individuals			

Chelsea Old Church (1712-1842) is located in the village of Chelsea, London (Fig. 3.1). The village's location on the Thames contributed to Chelsea's development both economically and socioculturally as the wealthy gentry who frequented or lived in the area had access by the river to the road of Whitehall which cuts though the district of Westminster (Cowie et al. 2008:10). Prior to the wartime bombings in the 1940s, Chelsea attracted considerable numbers of "courtiers and royal officials" who enjoyed the village's rural tranquility (Cowie et al. 2008:10). Landmarks of particular note in Chelsea during this time included Henry VIII's manor house as well as other Tudor houses and mansions (Cowie et al. 2008:10), exemplifying the town's wealthy status and appeal to royalty.

Chelsea began to grow in size by the mid-17th century and would come to experience continued growth through the 18th and 19th centuries. It was during this time that a total of three parish cemeteries were established in Chelsea to accommodate the growing population (Cowie et al. 2008:19). The village maintained its character as a rural township, "surrounded by fields, orchards, nurseries, and market gardens" (Cowie et al. 1008:13). By the 19th century, however, the village's rural character was transformed by the construction of houses and streets for its expanding population (Cowie et al. 2008:13), some of whom were buried in the Chelsea Old Church cemetery.

Material culture, as well as burial plots, unearthed from the 18th and 19th century Chelsea Old Church cemetery help to shed light on the class statuses of the buried. While a majority of the coffins were wood, nearly all were upholstered and decorated, as indicated by the presence of copper alloy and iron studs (Cowie et al. 2008:31). Furthermore, lead coffin plates that survived detailed the time and effort that went into inscribing and decorating the coffin. For example, raised shields and flowers were popular motifs found on the plates, with "a large degree of stylization of the flowers and leaves" (Cowie et al. 2008:32). Coffin coverings, too, such as wool or silk, were used to demonstrate one's wealth and social status; fragments of these were found in some cases (Cowie et al. 2008:35). Looking inside the coffin at its furnishings, not many examples of burial goods were found as being buried with grave goods was not common at this time (Cowie et al. 2008:38). However, individuals were often buried with "items of personal adornment", such as rings, earrings, and copper-alloy mounts for books or belts (Cowie et al. 2008:38). As the authors of the report note, it is fair to assume that the level of decoration of the coffin can indicate status of the individual or of the person paying for the individual's internment

(Cowie et al. 2008:32), with this decoration taking the form of coffin coverings, linings, personal items, and coffin plates.

St. Benet Sherehog

St. Benet Sherehog was a wealthy middle-class parish in the City of London north of the Thames during the 16th and 17th centuries. During excavation, 280 individuals were recovered. Of these, 253 were dated as post-medieval burials while 39 were estimated to be from the medieval era. For this study, 231 individuals whose skeletal data were provided in the St. Benet Sherehog WORD database were used. The site yielded 167 adults, 81 males and 46 females, with 41 unsexed adults and 63 subadults (Table 3.2).

Table 3.2 St. Benet Sherehog Cemetery Totals

Subadults	No Sex Available		% of Total Individuals	
Perinatal	11		4.7	
1-6 Months	7		3	
7-11 Months	1		0.4	
1-5 Years	17		7.3	
6-11 Years	9		3.9	
12-17 Years	12		5.2	
Unknown Age	6		2.5	
Subadult Totals	63		33.3	
Adults	Male	% of Total Individuals	Female	% of Total Individuals
18-25 Years	6	2.6	3	1.2
26-35 Years	17	7.3	13	5.7
36-45 Years	36	15.6	15	6.4
>46 Years	17	7.3	14	6
Unknown Age	5	2.1	1	0.4
Adult Totals	81	35	46	19.7
Complete Totals (41 Unknown Sex)	231 Individuals			

While St. Benet Sherehog was inhabited during the medieval period, the parish was destroyed by the Great Fire of 1666 which resulted in an overall population decrease of the

previously migrant-heavy community (Miles et al. 2008:8-9). The parish was slowly rebuilt after the fire, but the cemetery of St. Benet Sherehog, the source of the skeletal data used in this thesis, was converted into a shared ecclesiastic cemetery serving the churches of St. Benet Sherehog and St. Stephen Walbrook (Miles et al. 2008:43-44). The burials documented by the Museum of London and stored in the WORD database belong to the St. Benet Sherehog cemetery post-Great Fire and represent both a wealthy and a poor population (WORD database, 2018).

The parish was known to have been occupied by a high number of female servants, which is reflected in the estimated sex ratio of 90:100 males to females (Miles et al. 2008:8). The large presence of servants in the parish provides insight into how the wealthy members of the St. Benet Sherehog population lived. Despite this, however, the poor were also a prominent part of the parish's history as St. Benet Sherehog was a frequent recipient of poor relief in London via London's Poor Laws, which sought to alleviate the high levels of poverty within the parish (Miles et al. 2008:16). Of particular relevance for this study is the fact that any individuals within the parish's boundaries, rich or poor, were buried at St. Benet Sherehog, and class status was used within the parish to ensure that even the most destitute could be buried in the same plot as the wealthy. For example, there is documentation of the fact that when a poor man died in the street of St. Benet Sherehog, the parish would send a notice to a wealthier resident of the parish who was then tasked with paying for the stranger's coffin and burial in the cemetery (Miles et al. 2008:16).

It is important to highlight markers of wealth and status in St. Benet Sherehog because of the range of class statuses within the parish that are reflected in the cemetery. Much like Chelsea Old Church, few grave goods were recovered at the site. However, plates to identify burials, as well as coffin dressings and furniture, do help reveal status differences. For example, upholstery

pins to hold fabric on the outside of the covering were unearthed, as well as coffin nails, which, if particularly abundant, could indicate status (Miles et al. 2008:67). Additionally, the location of a burial vault belonging to Michael Davison, as well as a monument belonging to John Maurois, both located on the east side of the burial site, reflect high status and wealth, and the potential shift from the western half of the site to the eastern half over time may reflect a desire to be associated with these markers of wealth (Miles et al. 2008:67).

St. Bride's Lower

The final cemetery population analyzed in this thesis is St. Bride's Lower, located in the parish of St. Bride's on Farrington Street, London (Figure 3.1). The cemetery of St. Bride's Lower was primarily used from 1770-1894 and was built to accommodate the overcrowding of the wealthier St. Bride's Church churchyard. St. Bride's Lower appears to have been the resting place of the general poor parish population, populations from the workhouse, and populations from the nearby Fleet prison (WORD database, 2018).

According to Mant and Roberts (2015), citing an unpublished excavation report by Miles (2010), the St. Bride's Lower registrar noted "between 15 and 20 people, and sometimes 30 people were living in one house" at any one time (Miles 2010, quoted by Mant and Roberts 2015:192). The dead at St. Bride's Lower were typically interred in wooden coffins with few furnishings, which is in stark contrast to the lead coffins, crypts, and lavish decorations of the wealthier St. Bride's Fleet Church churchyard (DeWitte et al. 2015:243). No published site reports exist for the excavation of St. Bride's Lower (Rebecca Redfern, personal communication, March 5, 2019), which is why a cemetery plan cannot be provided here. However, a considerable number of studies have been conducted on St. Bride's Lower due to the large number of skeletons exhumed and the general completeness of the sample; given this, there is a large body

of research to be cited that, while not directly from a Museum of London report, provides a significant amount of information on the cemetery and its population. Furthermore, all skeletal data in the WORD database are currently accessible. This population of 606 excavated individuals, 544 of which were analyzed, consists of 380 adults (194 males, 125 females, and 50 indeterminate) and 175 subadults (Table 3.3).

Material culture from this site is sparse as no formal site report was published. However, an extract from a unpublished site report by Miles (2010) does detail the conditions in which individuals were interred, which included stacking of individuals, suggesting that grave disturbance was common as revealed by a vault with approximately 47 individuals to which 75 more were added shortly afterward (Miles 2010:5).

Table 3.3 St. Bride's Lower Cemetery Totals

Subadults	No Sex Available		% of Total Individuals	
Perinatal	36		6.7	
1-6 Months	16		3	
7-11 Months	7		1.2	
1-5 Years	85		15.7	
6-11 Years	16		3	
12-17 Years	10		1.9	
Unknown Age	5		1	
Subadult Totals	175		32.5	
Adults	Male	% of Total Individuals	Female	% of Total Individuals
18-25 Years	5	1	4	0.7
26-35 Years	22	4	21	3.9
36-45 Years	54	10	30	5.6
>46 Years	88	16.1	64	11.8
Unknown Age	25	4.6	6	1.1
Adult Totals	194	35.7	125	23.1
Complete Totals (50 Unknown Sex)	544 Individuals			

Literary Sources

To supplement the osteological data, primary and secondary literary texts were used to determine how English society perceived and defined appropriate gender and class roles and to test whether the lived experiences of Londoners, as reflected in the statistical results of the mortuary analysis, align with the expected gender and class configurations as documented in the textual record from the time.

Various secondary sources that discuss literature during the Long Eighteenth Century were used in this thesis to demonstrate how novels, guidebooks, and newspapers represented gender and class roles in English society. For example, Charlotte Lennox's *The Female Quixote; or, The Adventures of Arabella* (1752) was analyzed by Laurie Langbauer (1990) and Elizabeth Bergen Brophy (1991). In this 18th century piece, Lennox's character Arabella falls victim to her fabricated delusional reality of living inside a romance novel when faced with the prospect of marrying her cousin after her father's death. Arabella lives as a romance novel's heroine, encouraging potential suitors to fight over her and impressing men with her rationality and wit (Langbauer 1990:68-69). While Lennox's piece was meant to critique the ridiculous aspects of the romance novel and the language it utilizes, the main character falls victim to traditional social conformity after being convinced by a doctor to renounce her obsession with the genre following a failed suicide attempt described in the style of a French romance novel. The story ultimately concludes with Arabella giving her hand in marriage to her cousin (Langbauer 1990:69). Arabella, like characters in other works by Lennox, are women who "try to control their own destinies" but often fail (Brophy 1991:249). This trend is not exclusive to Lennox's work; Aphra Behn, a 17th century author, also wrote stories in which her female characters subverted gender roles and challenged common expectations of their sex only to marry their suitors and fade away quietly (Barca 2018:6-7). This trend in British literature reinforces the social expectations at the

time that, at the conclusions of their stories, women must be docile and subordinate to the men around them to maintain the status quo. When discussed within an osteological context, this type of social conformity may show in female-bodied individuals who spent their lives in the domestic sphere and were shielded from the dangers of the masculine occupational and social lifestyle.

Daniel Defoe, too, is an author extensively discussed in studies of gender and class in 18th century English society. In Helene Moglen's *The Trauma of Gender: A Feminist Theory of the English Novel* (2001), Defoe's *Robinson Crusoe* (1719), *Moll Flanders* (1722), and *Roxana* (1724) were examined from the perspective of the philosophy of individualism and how it interacts with gender roles in the author's works. As Moglen (2001:19) explains, in this philosophy, men and women could survive "and even prosper under the volatile conditions of entrepreneurial capitalism". While individualism was explored in the aforementioned works, however, Defoe's de facto association of women with motherhood and domesticity contrasts considerably with how Defoe interprets individualism from the perspective of his male characters, whose stories do not conclude with the abandonment of adventurous exploits. Instead, this theme is seen more commonly among his female characters, such as Roxana and Moll. Both characters, despite their entrepreneurial exploits due to the departure of the men in their lives, which destabilized their economic security (Moglen 2001:36), revert back to their original roles by the end of their stories. Roxana, who refused marriage initially, inevitably marries and remarks that her previous constant rejection of marriage was "a mark of her possession by the devil" (Moglen 2001:45, quoting Defoe 1724:197), while Moll, who became a successful capitalist, reconciled with her son in order to prove her "devoted maternity" to him after having initially abandoned her children (Moglen 2001:43).

Defoe's depiction of men contrasts greatly with how he depicts women. For example, in *Robinson Crusoe,* the title character completes his story of individualism not by leaving behind his adventures and settling down with a wife and children, but by becoming "a political agent, an entrepreneurial capitalist, an imperialist, and a self-dependent male" (Moglen 2001:34). While Crusoe must engage in feminine behavior while stranded, such as sewing, cooking, and domesticating animals, he does not conform to this feminine behavior—instead, he conquers it. As the author explains,

> Defoe participates in the dominant political and scientific discourse of his time. Constructed by—and also helping to construct—the sexual division of labor that was then in the process of revision, those discourses placed rational masculinity against a feminine nature, subordinating the latter to the former, as feminine feeling was subordinated to the masculine mind (Moglen 2001:34).

As demonstrated by Defoe's works, while 18th century women may have had the potential to step outside of their socially prescribed gender roles of motherhood and domesticity, they ultimately were required to return to those roles to reestablish the social order. Men, however, were viewed as capable of engaging with both masculinity and femininity, so long as femininity is dominated and made masculine. Furthermore, this dynamic also suggests that women's work is so easy that "any man" can do it if necessary.

Novels are not the only source of social commentary on class and gender roles available from the 18th century, however. Conduct books and essays directed towards men, women, and children were also used by London's citizens to model proper gendered conduct. For example, *The Ladies Calling* (1673), a conduct book written by Richard Allestree that was so popular that it continued in print into the 1700s, has chapter titles that focus on "modesty, meekness, compassion, affability, and piety" (Brophy 1991:8). Men, as individuals of reason and discipline, are instructed to help women to control their "natural imbecility" and passions (Brophy 1991:9),

and in return, women are to show their necessary duty "to his person, to his reputation, and to his fortune" (Brophy 1991:10, quoting Allestree 1673:10). It is clear, upon further reading of *The Ladies Calling*, that the conduct book was written with wealthier women in mind—for example, widows are encouraged to "retire from the world and devote themselves to their children's welfare and to works of charity" (Brophy 1991:10), a form of conduct that would have been impossible for poor widows. Other conduct books from the time include *The Gentleman's Calling* (1660), *The Ladies Library* (1714), and *The Whole Duty of a Woman* (1701), as well as children's books that were considered "thinly disguised conduct books" (Brophy 1991:13), such as *May Day; or, Anecdotes of Miss Lydia Lively, Intended to Improve and Amuse Rising Generations* (1787), which directed young girls to embrace submission and domesticity.

The standards that men were held to, however, were limited at best and dangerous at worst. For example, men who engaged in "masculine" behaviors such as drunkenness, promiscuity, and adultery would not be condemned; instead, these behaviors prompted expectation that wives would treat their husbands' wrongdoing with a gentle tenderness and patience (Brophy 1991:10). In fact, this type of masculine behavior was seen in the novel *Clarissa, or, the History of a Young Lady* (1748) by Samuel Richardson, in which the controlling Robert Lovelace rapes the title character Clarissa when she refuses to marry him, believing that Clarissa cannot refuse his hand if he strips her of her virginity and thus her reputation (Brophy 1991:24-25). Despite Clarissa continuing to refuse Lovelace after being violated, Brophy notes a sense of "waste" in the conclusion of the piece. As she explains, "The waste is even more poignant when we realize that Lovelace's attitude towards women is in many ways only an intensified version of the general attitude of the century" (Brophy 1991:25). While the story of Clarissa—and the other examples discussed here—clearly focus on the wealthier classes in

London during the 18th century, the dichotomy of the submissive, passive woman and the powerful, active man permeate the mediums of written text that were culturally relevant and highly influential in London during this time. It is to be expected, then, that the analysis conducted in this thesis should correspond to written texts from the English Long Eighteenth Century. Provided that the wealthy followed the behavioral trends encouraged in conduct books and novels and the middle-class and poor attempted to mimic them, with varying degrees of success, the pathological profiles of Chelsea Old Church, St. Benet Sherehog, and St. Bride's Lower should reflect distinctly different patterns of conformity. This thesis tests the idea that socioeconomic status would have contributed to an individual's ability to conform or deviate from these established social mores.

Chapter 4: Methods and Analysis

The Sample

Data related to disease and trauma were recorded for adults from each population for whom sex identification is currently available (Tables 4.1-4.3) and who fit the pathological criteria established in Appendix B. The Chelsea Old Church sample includes 120 adult, sexed individuals, the St. Benet Sherehog sample includes 87, and the St. Bride's Lower sample includes 224, for a collective total of 431 sexed adult individuals (Table 4.2). The data used for this thesis were taken from their respective databases accessed through the Museum of London WORD site and compiled into a separate set of databases (see Appendices D, C, and E). The percentages of the sample populations are as follows: 28% of the sample is from Chelsea Old Church, 20% of the sample is from St. Benet Sherehog, and 52% of the sample is from St. Bride's Lower (Figure 4.1).

Table 4.1 Individuals of Questionable Sex

Chelsea Old Church				St. Benet Sherehog				St. Bride's Lower			
Potentially Male	%	Potentially Female	%	Potentially Male	%	Potentially Female	%	Potentially Male	%	Potentially Female	%
9	7	9	7	7	8	7	8	20	9	15	7

The total sample also includes individuals whose sex was not confidently determined but who were estimated to likely be male or female, as outlined in WORD. The decision to include such individuals was twofold: firstly, WORD acknowledges those individuals within their respective "male" and "female" categories while taking into consideration the fact that sex estimation cannot be wholly confident, but because enough evidence is present, it was concluded that these questionable individuals could potentially be fit into a sex category.

Secondly, by removing individuals of questionable sex, the sample size would be diminished, potentially yielding less accurate results. While individuals whose sex was less confidently established do not constitute a major portion of the sample, they contribute enough to the total sample site that their removal from the analysis would potentially skew the results of the analysis presented here (Table 4.1; Figure 4.1). Thus, the decision was made to include the small number of questionable individuals in order to augment the sample size and provide more data to work with given the assumed confidence of sex estimation documented in WORD. For the entire sample population, only 15.4% of the sample are individuals of questionable sex.

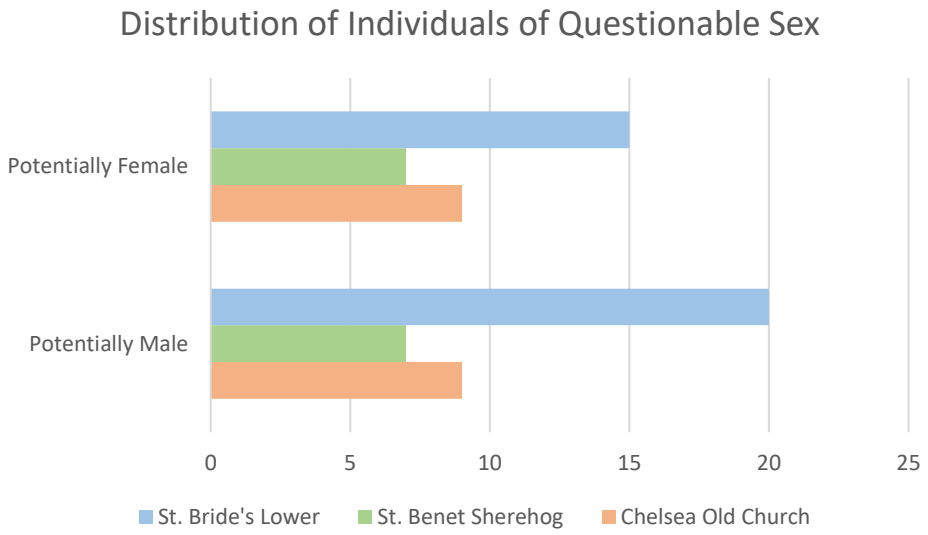

Figure 4.1 Clustered bar chart representing the distribution of individuals of questionable sex.

For the purposes of this project, the category "adult" was defined as persons positively identified via the WORD database as being 18 years old or older. Given that sex identification of subadults is problematic until puberty (Geller 2017:80), individuals confidently estimated to be under 18 years old were excluded from this analysis (Table 4.2; Figure 4.2).

The goal of the analysis was to determine whether the members of the three cemetery populations reflect the prescribed social roles with respect to gender and class that would be

Table 4.2 Sex and Age Totals

	Chelsea Old Church				St. Benet Sherehog				St. Bride's Lower			
	Male	%	Female	%	Male	%	Female	%	Male	%	Female	%
18-25	3	2.6	7	5	2	2.3	1	1.1	5	2.2	1	0.4
26-35	6	5	4	2.6	10	10.7	9	10.6	13	5.8	14	6.1
36-45	23	19.3	13	11	31	34.5	8	9.4	44	19.4	21	9.2
>46	31	26.9	33	27.8	13	15.4	13	15.2	74	33.7	52	23
Total	63	53.8	57	46.2	56	65.4	31	36.3	136	61.1	88	39
	120				87				224			

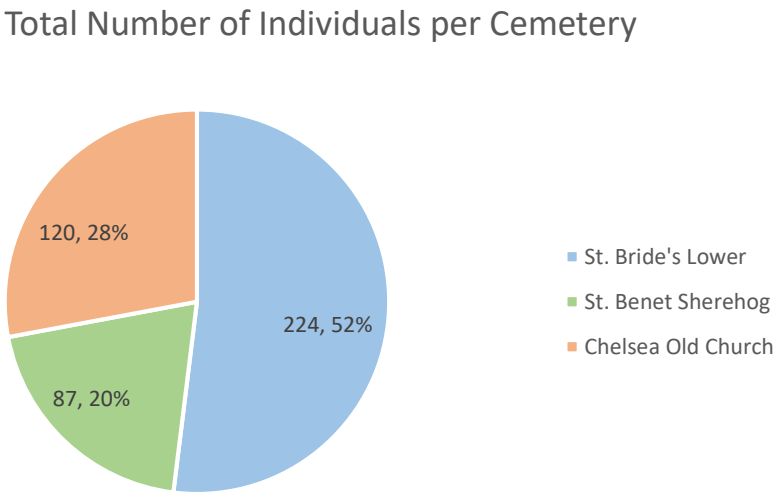

Figure 4.2 Pie chart of percentage and numeric distribution of individuals per cemetery.

expected based on the trauma and disease profiles reflected in the human skeletal dataset. If individuals in the three populations conformed to the stereotypical 18th/19th century expectations of their genders, it was expected that men, as protectors of their households, including their wives and children, would be afflicted with higher rates of occupational/physical trauma and disease, such as breakages, fractures, and osteoarthritis. Women, on the other hand, as caretakers and nurturers of their children, were expected to have been shielded from the risks of masculine roles. However, it was predicted that they would be more susceptible to nutritional/metabolic

pathologies due to pregnancy, breastfeeding, and general childrearing, as well as limited access to nutrient-rich foods, specifically protein-heavy foods like meat, which were largely consumed by men.

Correspondence Analysis

In order to compare the distribution of trauma and disease within and between the three cemeteries included in this project, correspondence analysis was applied to the disease and trauma versus sex and age data. Despite being a relatively new multivariate analytical method, correspondence analysis has gained popularity in archaeological and anthropological research (Clouse 1999:96). Correspondence analysis, hereafter referred to as CA, is "a statistical visualization method for picturing the associations between the levels of a two-way contingency table" in which "the observed association of two traits is summarized by the cell frequencies, and a typical inferential aspect is the study of whether certain levels of one characteristic are associated with some levels of another" (Lee 1996:65). The visual representation of CA data allows tabular data to be converted into easily interpretable images that can be described as well as analyzed and can even reveal "hidden patterns" present in the data (Alberti 2013:25; Clouse 1999:96).

To perform CA for this project, twenty-six pathologies were chosen from the WORD databases of Chelsea Old Church, St. Benet Sherehog, and St. Bride's Lower (Appendix A). Each pathology was chosen due to its presence in no fewer than 10 individuals total in each of the three cemeteries. These variables were compared to the sex and class data assigned to each individual via WORD. Pathological variables for each individual from the three cemeteries who met the qualifications to be included in the sample were recorded in an Excel file. In order to represent the presence and absence of the pathological variables for individual skeletal profiles,

the visual representation of "zero" (0) and "one" (1) was used in each variable's cell with zero indicating the absence of the pathological variable, and one indicating the presence of a pathological variable (see Appendix C). The completed Excel file was then imported into the statistical program R to perform CA. The remainder of this chapter will discuss the detailed steps taken to generate the results in this thesis and the analysis of the data. Chapter 5 presents the results of this analysis as well as the conclusions to be drawn from those results with respect to the research questions defined in Chapter 1.

The data were double-coded to create presence/absence variables for each condition. In order to double-code the data, the following codes were created: a plus-sign was placed in front of a condition if it was present, and a minus-sign was placed in front of a condition if it was absent. For example, Case 203 was coded for presence and absence of ankylosis by a 1 for ank- and a 0 for ank+, indicating that ankylosis was not present, while Case 11, which did have ankylosis, was coded by a 0 for ank- and a 1 for ank+. After double-coding the data, 52 conditions had been documented in the sample.

Individuals of questionable sex were then changed from F? and M? to F (female) and M (male), respectively, to increase the sample count to 175 females and 258 males across all three cemeteries. Then the number of times each condition was present or absent was tabulated (Tables 4.3-4.4). This approach allowed summary statistics for sex, class, and age in relation to the conditions present to be generated. After converting each condition into a presence/absence variable, the conditions were analyzed using R's CA package.

Table 4.3 Presence of each Condition

Condition	Code	# of Individuals	Condition	Code	# of Individuals
Ankylosis	ank+	34	Metabolic Disease	met+	12
Congenital Limb Abnormality	cla+	77	Osteitis	ost+	15
Congenital Skull Malformation	csm+	20	Osteoarthritis	osa+	148
Congenital Spinal Disorder	csd+	13	Osteoporosis	osp+	37
Cribra Orbitalia	cri+	54	Periostitis	per+	129
Dental Pathologies	den+	64	Rickets	ric+	24
DISH	DIS+	22	Scoliosis	sco+	19
Erosive Arthropathy	ero+	11	Spondylolysis	spo+	15
Fractures	fra+	123	Surgical Intervention	sur+	19
Gout	gou+	10	Trauma (Accidental)	tra+	25
Hyperostosis Frontalis Interna	hyp+	19	Trauma (Blunt Force)	trb+	6
Joint Disease	joi+	35	Trauma (Surgical)	trs+	45
Kyphosis	kyp+	12	Treponematosis	tre+	10

Table 4.4 Absence of each Condition

Condition	Code	# of Individuals	Condition	Code	# of Individuals
Ankylosis	ank-	398	Metabolic Disease	met-	420
Congenital Limb Abnormality	cla-	355	Osteitis	ost-	417
Congenital Skull Malformation	csm-	412	Osteoarthritis	osa-	284
Congenital Spinal Disorder	csd-	419	Osteoporosis	osp-	395
Cribra Orbitalia	cri-	378	Periostitis	per-	303
Dental Pathologies	den-	368	Rickets	ric-	408
DISH	DIS-	410	Scoliosis	sco-	413
Erosive Arthropathy	ero-	421	Spondylolysis	spo-	417
Fractures	fra-	309	Surgical Intervention	sur-	413
Gout	gou-	422	Trauma (Accidental)	tra-	407
Hyperostosis Frontalis Interna	hyp-	413	Trauma (Blunt Force)	trb-	426
Joint Disease	joi-	397	Trauma (Surgical)	trs-	387
Kyphosis	kyp-	420	Treponematosis	tre-	422

Joint Correspondence Analysis

Joint Correspondence Analysis (JCA) was performed with sex, age, and class as supplementary variables, allowing the patterning of conditions without these variables to be calculated into the dimension of the plot. As a result, the supplemental variables could be calculated and plotted without being influenced by other supplemental variables, i.e. sex does not influence age, age does not influence class, etc. (Figure 4.3).

Results of Analysis

Descriptive Statistics of External Variables

In the sex distribution, males exhibit a higher number of traits than females (Figure 4.3).

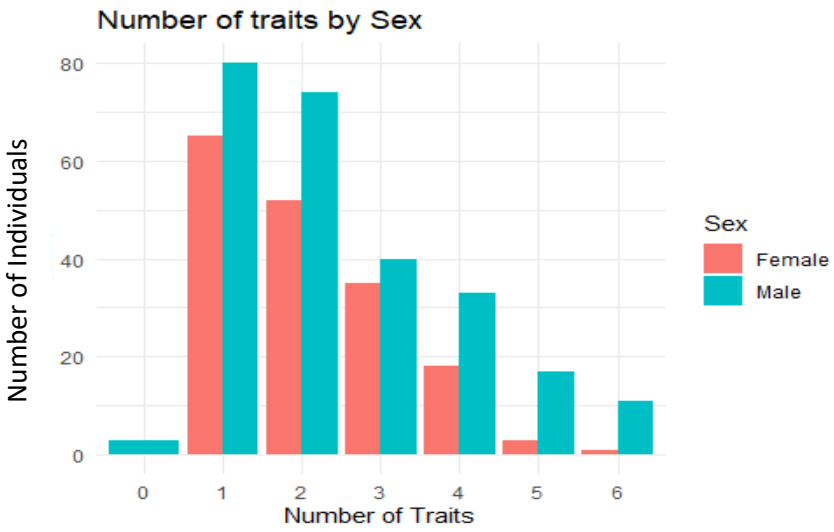

Figure 4.3 Visual distribution of number of traits by sex.

The difference in the means for males and females is statistically significant (Figure 4.4). Males exhibit a greater number of traits than females, suggesting that they were likely exposed to greater stress in daily life that impacted them more intensely than females—as such, however, it will be necessary to examine if the stress inflicted on males was nutritional, this thesis anticipates

to be the primary stressor for females, or physical, which this thesis anticipates was the primary stressor for males.

```
##
## The mean number of traits for each sex:

##   Group.1        x
## 1       F 2.109195
## 2       M 2.445736

##
## The standard deviation of traits for each sex:

##   Group.1        x
## 1       F 1.109406
## 2       M 1.451874

##
##  Welch Two Sample t-test
##
## data:  nTrait by sex
## t = -2.7258, df = 423.3, p-value = 0.006681
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.57922313 -0.09385893
## sample estimates:
## mean in group F mean in group M
##        2.109195        2.445736
```

Figure 4.4 Mean, standard deviation, and Welch's t-test of sex.

The class distribution indicates that individuals in the low-class cemetery of St. Bride's Lower exhibited a higher prevalence of traits than the other cemeteries, with the exception of the upper-class cemetery of Chelsea Old Church, whose populations exhibits the second highest distribution of conditions (Figure 4.5). The means for the three classes differ slightly, but the differences are not statistically significant (Figure 4.6). The age variable exhibits a fairly simple distribution of traits: the oldest individuals display the most traits, and the older the age group, the more traits the individual exhibits (Figure 4.7).

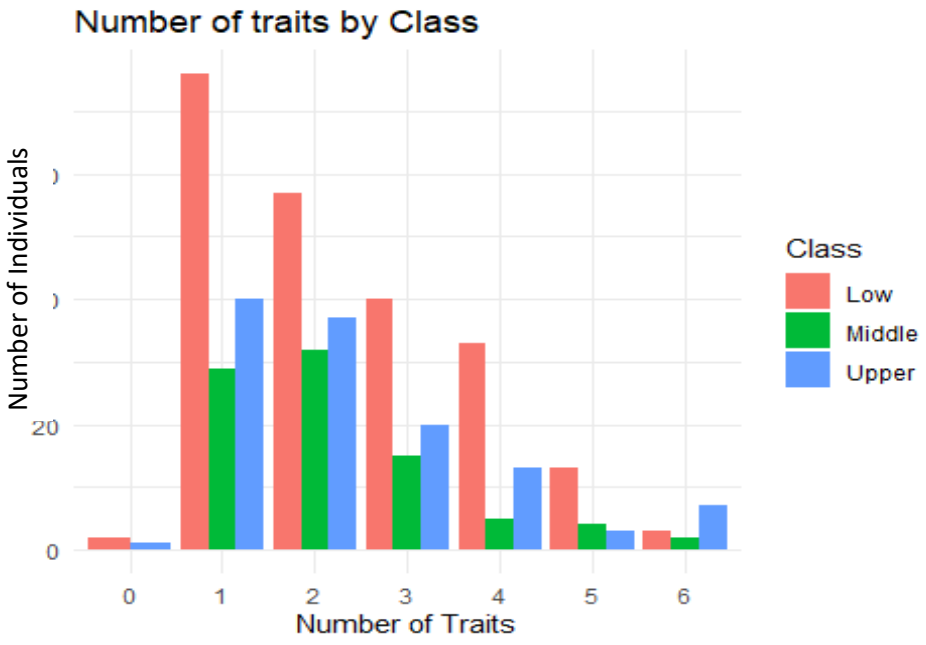

Figure 4.5 Visual distribution of number of traits by class.

```
##
## The mean number of traits for each class:

##   Group.1        x
## 1     Low 2.343750
## 2  Middle 2.183908
## 3   Upper 2.338843

##
## The standard deviation of traits for each class:

##   Group.1        x
## 1     Low 1.330112
## 2  Middle 1.225018
## 3   Upper 1.417473

##              Df Sum Sq Mean Sq F value Pr(>F)
## class         2    1.7  0.8695   0.488  0.614
## Residuals   429  764.7  1.7825

##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##
## Fit: aov(formula = nTrait ~ class, data = classN)
##
## $class
##                       diff        lwr       upr     p adj
## Middle-Low   -0.159841954 -0.5565096 0.2368257 0.6103730
## Upper-Low    -0.004907025 -0.3591678 0.3493538 0.9994151
## Upper-Middle  0.154934929 -0.2864420 0.5963118 0.6873570
```

Figure 4.6 Mean, standard deviation, and post-hoc test for class.

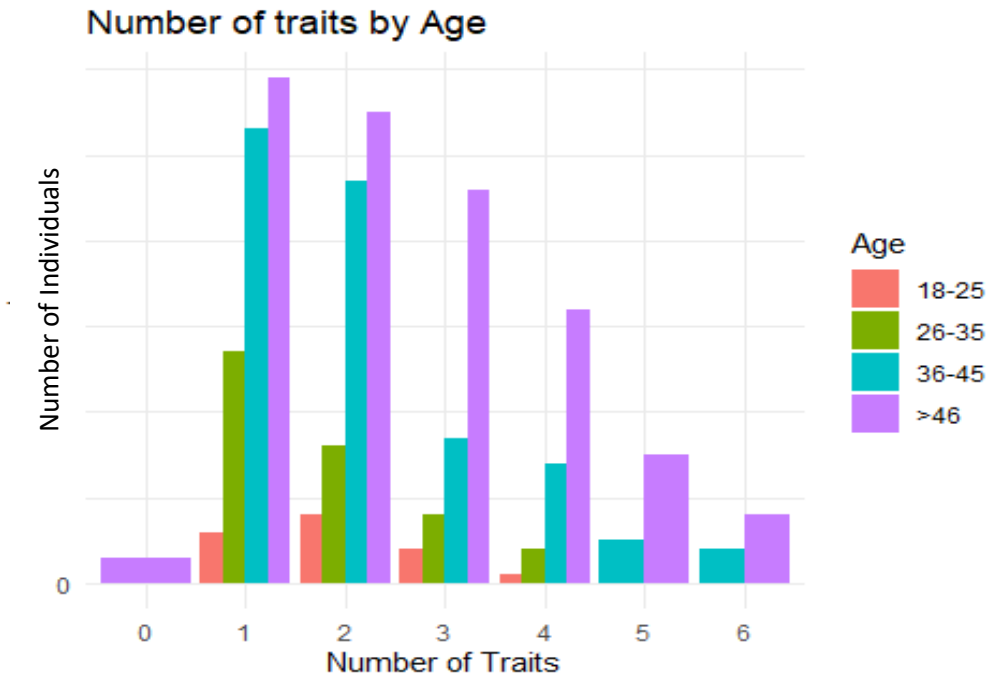

Figure 4.7 Visual distribution of number of traits to age.

The post-hoc test indicates that the >46 years of age group has a significantly higher mean than the 26-35 and the 36-45 groups (Figure 4.8). The only exception to this is the 18-25 group; however, this is likely because of the small number of cases in the youngest age group.

This distribution indicates that the oldest individuals, who were able to overcome stressors throughout the youngest and most vulnerable years of their lives, lived to old age and had the opportunity to accumulate a lifetime of pathological and traumatic conditions. In descending order to the next age group, the same logic applies, sans the fact that individuals in these groups were able to overcome less and, as a result, died younger than 46 years of age. Those between the ages of 18 to 25 experienced the least number of conditions throughout their lives to the point where no individual in the youngest age group had accumulated five or more conditions per individual.

```
##
## The mean number of traits for each age group:

##   Group.1        x
## 1   18-25 2.000000
## 2   26-35 1.800000
## 3   36-45 2.164286
## 4     >46 2.559633

##
## The standard deviation of traits for each age group:

##   Group.1         x
## 1   18-25 0.8819171
## 2   26-35 0.9506333
## 3   36-45 1.2897533
## 4     >46 1.4235102

##              Df Sum Sq Mean Sq F value   Pr(>F)
## age           3   32.7  10.896   6.356 0.000319 ***
## Residuals   428  733.7   1.714
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##   Tukey multiple comparisons of means
##     95% family-wise confidence level
##     factor levels have been ordered
##
## Fit: aov(formula = nTrait ~ age, data = ageN)
##
## $age
##                   diff         lwr       upr     p adj
## 18-25-26-35 0.2000000 -0.69864001 1.0986400 0.9398089
## 36-45-26-35 0.3642857 -0.17311715 0.9016886 0.3000641
## >46-26-35   0.7596330  0.25006782 1.2691982 0.0007985
## 36-45-18-25 0.1642857 -0.66134488 0.9899163 0.9559225
## >46-18-25   0.5596330 -0.24815453 1.3674206 0.2810591
## >46-36-45   0.3953473  0.02960325 0.7610914 0.0282593
```

Figure 4.8 Mean, standard deviation, and post-hoc test for age.

Results of Joint Correspondence Analysis

Figure 4.9 shows the presence and absence of each condition plotted to reveal potential clusters. The plot clearly shows that the first dimension opposes ankylosis and DISH to gout, kyphosis, erosive arthropathy, and cribra orbitalia, while the second dimension opposes gout, kyphosis, erosive arthropathy, fractures, and osteoarthritis to cribra orbitalia. Figure 4.10 reveals how these conditions are distributed across the supplemental variables of age, sex, and class.

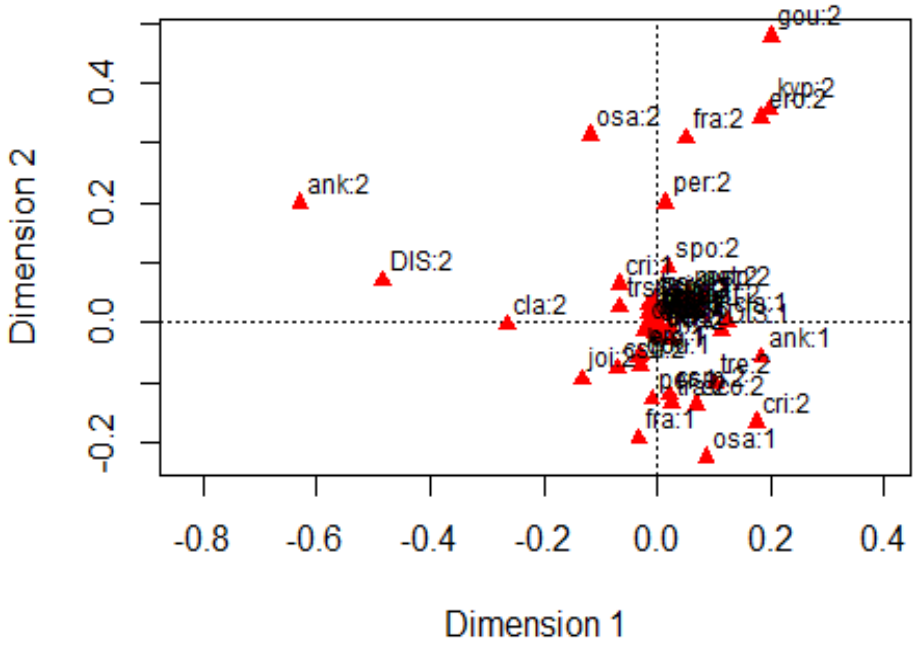

Figure 4.9 Plot of conditions in relation to supplemental variables in Figure 4.10.

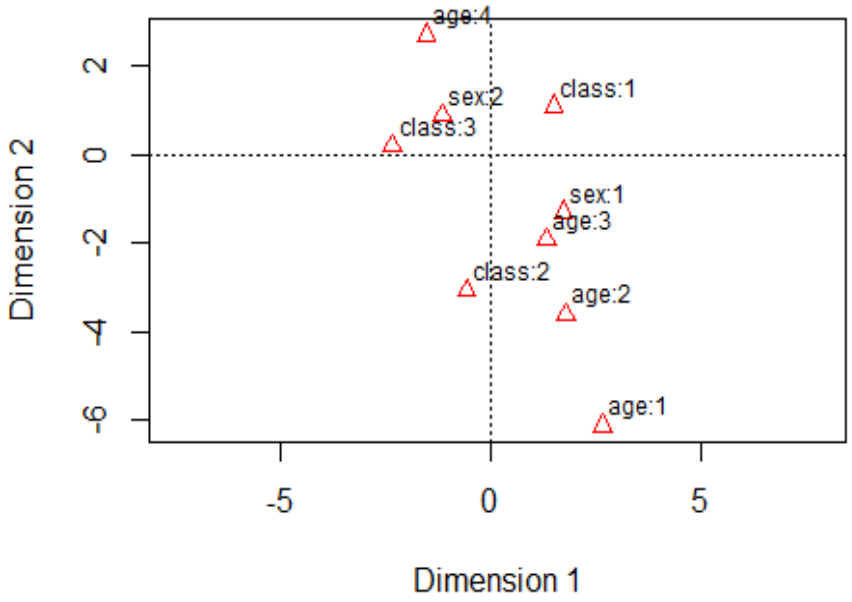

Figure 4.10 Plot of supplemental variables in relation to conditions in Figure 4.9.

Figure 4.9 shows variables plotted in relation to the conditions in the sample and not the supplemental variables, so the locations of the variables of age, sex, and class are not reflective

of distribution to one another, but rather represent where the supplemental variables are distributed in relation to the conditions. For example, the variable “males” (sex2) near the variable “upper-class” (class3) in Figure 4.10 does not suggest that there are more males in the upper-class cemetery; rather, by mirroring Figures 4.9 and 4.10, males from all three cemeteries including male individuals in the upper-class cemetery of Chelsea Old Church were more likely to display signs of DISH (DIS:2), ankylosis (ank:2), and osteoarthritis (osa:2) than females.

Table 4.5 Key for Figure 4.2

Supplemental Variable	Explanation
Sex:1	Female
Sex:2	Male
Class:1	Low class
Class:2	Middle class
Class:3	Upper class
Age:1	18-25
Age:2	26-35
Age:3	36-45
Age:4	>46

By conditioning class and sex, the results show that males were more common in the poorest cemetery of St. Bride’s Lower than females, though the difference is not great (Figure 4.5).

By performing a JCA, visual depictions of the data can provide insight into the different types of variables being examined in this thesis, allowing a clearer picture to emerge regarding how disease afflicted individuals across the lines of sex, age, and class. The correlation values generated by the JCA were then arrayed from highest to lowest value for each condition, and tables and chi-squared tables were created for the three supplemental variables (sex, age, class) (Appendix D).

```
(tab<-table(barcaSingle$sex,barcaSingle$class))

##
##       1   2   3
##   1  86  31  57
##   2 138  56  64

prop.table(tab,1)

##
##             1         2         3
##   1 0.4942529 0.1781609 0.3275862
##   2 0.5348837 0.2170543 0.2480620
```

Figure 4.11 Conditioning class and sex. Row numbers 1 through 3 represent class (1=low class, 2=middle class, 3=upper class). Column numbers 1 and 2 represent sex (1=female and 2=male).

This allowed three JCA plots to be created that reveal the distribution of individuals according to sex, class, and age respectively (Figures 4.6-4.8). For example, Figure 4.6 reflects the distribution of sexes in Figure 4.3, where males favor the left side of the first dimension while females favor the right side. Similarly, as seen in Figure 4.7, the low-class variable favors the upper right side of dimension 1 just as it does in Figure 4.3.

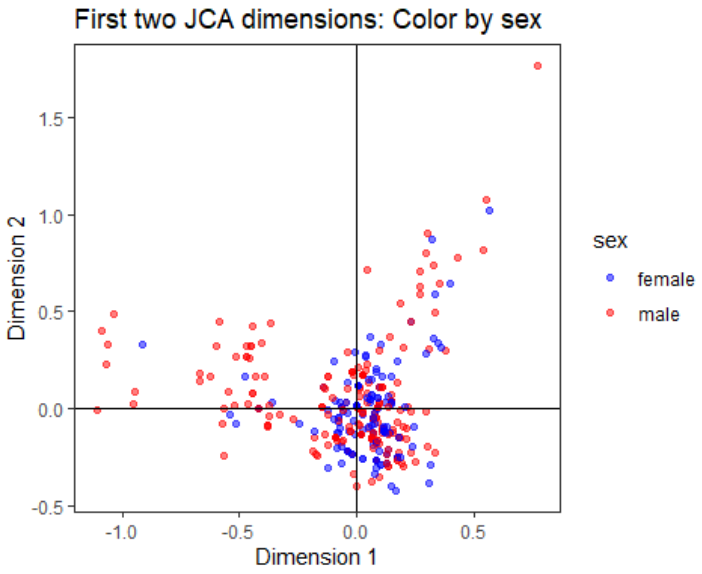

Figure 4.12 Grouping of cases according to sex.

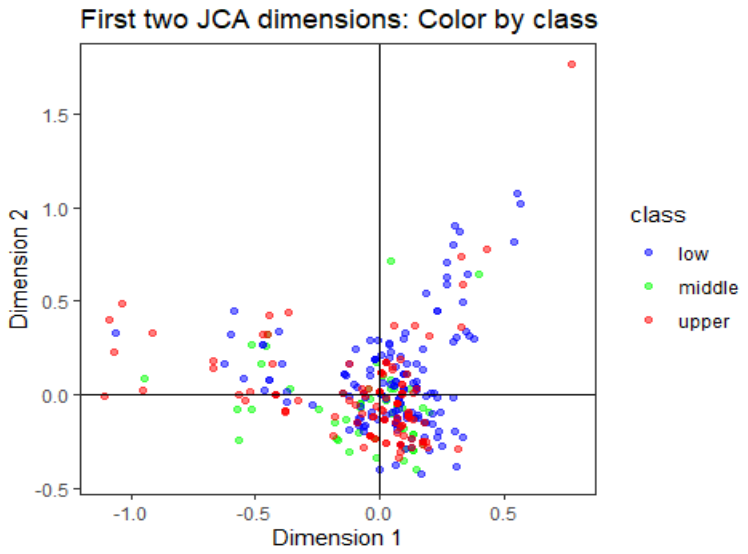

Figure 4.13 Grouping of cases according to class.

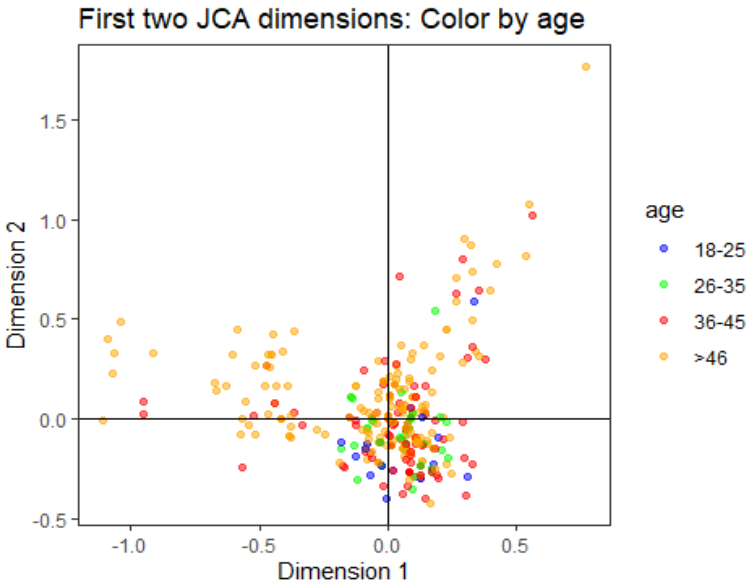

Figure 4.14 Grouping of cases according to age.

Forced Classification

Forced classification alters the weight of a column or row of data in the matrix without altering the data matrix (Gray 1998:23), allowing conditions to be compared directly to

individual categories within sex, class, and age, specifically male/female, low/middle/high, and 18-25, 26-35, 36-45, and >46, respectively.

Forced Classification for Sex

When carrying out forced classification for sex, the trait fra (fractures) generated a correlation score over 0.20, indicating that it is associated with sex (Figure 4.15).

```
##
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9991 0.1500 0.0978 0.0457 0.0358 0.1148 0.1383 0.1870 0.0131 0.2094
## [11] 0.0031 0.1115 0.0172 0.0876 0.1289 0.0578 0.0104 0.1816 0.0547 0.0522
## [21] 0.0359 0.0857 0.0919 0.0220 0.0629 0.0888 0.0681
```

Figure 4.15 Forced classification of sex with the fracture (fra) variable circled in orange.

The conditional table in Figure 4.16 shows that 35.66% of male burials had fractures (fra+) compared to 17.82% of female burials.

```
(tab<-table(x$sex,x$fra))

##
##       1   2
##   1 143  31
##   2 166  92

rownames(tab)<-c("female","male")
colnames(tab)<-c("fra-","fra+")
(prop.table(tab,1))

##
##               fra-      fra+
##   female 0.8218391 0.1781609
##   male   0.6434109 0.3565891

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 15.381, df = 1, p-value = 8.789e-05
```

Figure 4.16 Conditional table of fractures (fra) variable on sex.

Discriminate scores in a logistic regression plot can reveal the visual differences between the sexes when analyzing the prevalence of each condition in relation to sex. It is the confusion matrix, then, that shows the accuracy of the trait being analyzed in relation to the condition using the $p<0.05$ threshold; this is compared to guessing the most common category of sex based on chance. If the accuracy determined from the confusion matrix is less than the p-value, it is statistically significant, and the number generated from the confusion matrix is better than guessing the most common category of sex. For example, the accuracy of predicting males is 79.46% while the accuracy of predicting females is 54.60% (Figure 4.17). These same steps were repeated for the cemeteries for class status, as well as for all four age groups.

```
## Confusion Matrix and Statistics
##
##
## sex.pred female male
##   female     95   53
##   male       79  205
##
##                Accuracy : 0.6944
##                  95% CI : (0.6486, 0.7376)
##     No Information Rate : 0.5972
##     P-Value [Acc > NIR] : 1.769e-05
##
##                   Kappa : 0.349
##
##  Mcnemar's Test P-Value : 0.02956
##
##             Sensitivity : 0.7946
##             Specificity : 0.5460
##          Pos Pred Value : 0.7218
##          Neg Pred Value : 0.6419
##              Prevalence : 0.5972
##          Detection Rate : 0.4745
##    Detection Prevalence : 0.6574
##       Balanced Accuracy : 0.6703
##
##        'Positive' Class : male
##
```

Figure 4.17 Confusion matrix for the forced classification of sex. Note the accuracy of predicting males afflicted with conditions is 79.46%, only marginally better than guessing the most common category (male with 59.72%).

Forced Classification for Lower Class Cemetery

When carrying out forced classification for the cemeteries that are differentiated along class lines, the following binary variables were created: low/other, middle/other, high/other. The "other" in these variables represents cemeteries that were not the primary focus of the analysis. For example, the binary variable of low/other represents the lower status cemetery of St. Bride's Lower compared to St. Benet Sherehog and Chelsea Old Church.

Of the 224 burials from St. Bride's Lower, two variables have correlations higher than 0.20—fractures (fra), with a correlation score of 0.2363, and joint disease (joi) with a correlation score of 0.3293 (Figure 4.18).

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9991 0.1592 0.0376 0.1797 0.1396 0.0886 0.1114 0.0803 0.1043 0.2363
## [11] 0.0028 0.0487 0.3293 0.0564 0.0816 0.1189 0.0458 0.0868 0.0154 0.0946
## [21] 0.0292 0.0745 0.1709 0.0410 0.0813 0.0116 0.0923
```

Figure 4.18 Forced classification of low/other with the variables fracture (fra) (0.236) and joint disease (joi) (0.3293) circled in orange.

By using these variables, the conditional table reveals that 37.95% of burials from the low status cemetery of St. Bride's Lower have fractures, while only 18.27% of burials in St. Benet Sherehog and Chelsea Old Church exhibit signs of fractures (Figure 4.19).

Similarly, the conditional table displaying the distribution of joint disease (joi) between the low status cemetery and the other cemeteries indicates that 16.83% of the burials in the other cemeteries show signs of joint disease, while none of the burials in the low status cemetery of St. Bride's Lower show signs of joint disease (Figure 4.20).

```
(tab<-table(x$lowvar,x$fra))

##
##       1   2
##   1 170  38
##   2 139  85

rownames(tab)<-c("other","low")
colnames(tab)<-c("fra-","fra+")
(prop.table(tab,1))

##
##              fra-      fra+
##   other 0.8173077 0.1826923
##   low   0.6205357 0.3794643

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 19.55, df = 1, p-value = 9.8e-06
```

Figure 4.19 Conditional table of fractures (fra) variable on low/other.

```
(tab<-table(x$low,x$joi))

##
##       1   2
##   1 173  35
##   2 224   0

rownames(tab)<-c("other","low")
colnames(tab)<-c("joi-","joi+")
(prop.table(tab,1))

##
##              joi-      joi+
##   other 0.8317308 0.1682692
##   low   1.0000000 0.0000000

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 38.786, df = 1, p-value = 4.728e-10
```

Figure 4.20 Conditional table of joint disease (joi) variable on low/other.

Lastly, the confusion matrix reveals that the accuracy of distinguishing burials between low class status and other cemeteries is 70.14%, which is statistically significant (p=7.878e-15) (Figure 4.21) and is more accurate than just guessing the most common category of cemetery (low, 51.85%). Evidently, low status was a greater source of difference than sex in this analysis.

```
## Confusion Matrix and Statistics
##
##
## low.pred other low
##    other   143  64
##    low      65 160
##
##                Accuracy : 0.7014
##                  95% CI : (0.6558, 0.7442)
##     No Information Rate : 0.5185
##     P-Value [Acc > NIR] : 7.878e-15
##
##                   Kappa : 0.4019
##
##  Mcnemar's Test P-Value : 1
##
##             Sensitivity : 0.7143
##             Specificity : 0.6875
##          Pos Pred Value : 0.7111
##          Neg Pred Value : 0.6908
##              Prevalence : 0.5185
##          Detection Rate : 0.3704
##    Detection Prevalence : 0.5208
##       Balanced Accuracy : 0.7009
##
##        'Positive' Class : low
##
```

Figure 4.21 Confusion matrix for the forced classification of low/other. Note the accuracy of predicting the low status cemetery is 70.14%, which is marginally better than guessing the most common category of cemetery (low with 51.85%).

Forced Classification for Middle Class Cemetery

As with the low status cemetery of St. Bride's Lower, the forced classification of the middle-class cemetery of St. Benet Sherehog necessitated the creation of three binary variables: low/other, middle/other, and high/other. None of the variables had correlation scores higher than

0.20; the most prevalent conditions were dental pathologies (den) (0.1932) and fractures (fra) (0.1957) (Figure 4.22).

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9992 0.0025 0.0412 0.1196 0.1613 0.0623 0.1932 0.0387 0.0910 0.1957
## [11] 0.0048 0.0691 0.1626 0.0948 0.0532 0.0745 0.0664 0.0339 0.0730 0.0592
## [21] 0.0052 0.0336 0.1175 0.1064 0.0657 0.0176 0.0424
```

Figure 4.22 Forced classification of middle/other with the variables dental pathology (den) (0.1932) and fractures (fra) (0.1957) circled in orange.

Fractures and dental pathology were the conditions closest to the 0.20 threshold, so conditional tables were generated for each. However, only 12.64% of middle-class burials exhibited signs of fractures, while 32.46% of other cemeteries exhibited fractures (Figure 4.23). The numbers were reversed when examining dental pathology, however, as 27.59% of burials in the middle-class cemetery exhibited signs of dental pathology, while only 11.59% of burials in the other two cemeteries did (Figure 4.24).

```
(tab<-table(x$midvar,x$fra))

##
##       1   2
##   1 233 112
##   2  76  11

rownames(tab)<-c("other","middle")
colnames(tab)<-c("fra-","fra+")
(prop.table(tab,1))

##
##                fra-      fra+
##   other  0.6753623 0.3246377
##   middle 0.8735632 0.1264368

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 12.446, df = 1, p-value = 0.0004188
```

Figure 4.23 Conditional table of fracture (fra) variable on middle/other.

```
(tab<-table(x$midvar,x$den))

##
##       1   2
##   1 305  40
##   2  63  24

rownames(tab)<-c("other","middle")
colnames(tab)<-c("den-","den+")
(prop.table(tab,1))

##
##                den-      den+
##   other  0.8840580 0.1159420
##   middle 0.7241379 0.2758621

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 12.841, df = 1, p-value = 0.0003391
```

Figure 4.24 Conditional table of dental pathology (den) variable on middle/other.

The following plot clearly represents the results of the forced classification, as the low-status and high-status cemeteries of St. Bride's Lower and Chelsea Old Church, respectively, exhibited an overall higher presence of fractures and thus are more represented on the plot (Figure 4.25).

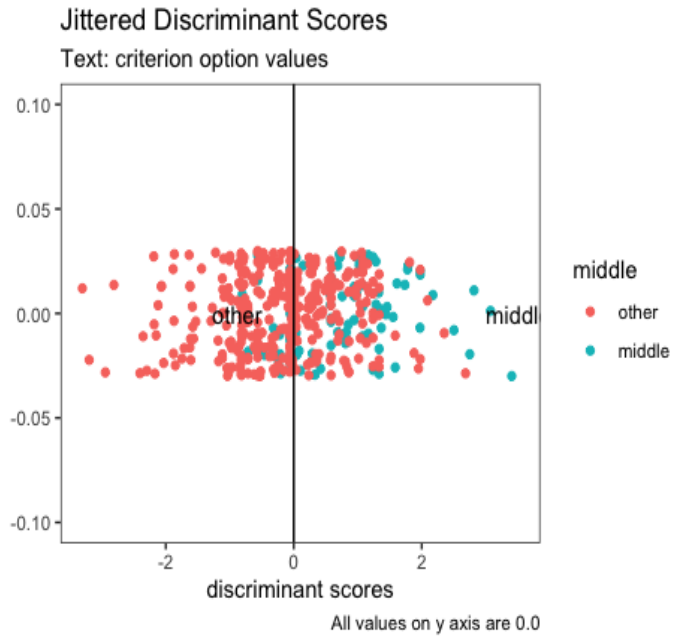

Figure 4.25 Plot of discriminant scores when comparing the distribution of conditions between the middle-class cemetery of St. Benet Sherehog to St. Bride's Lower and Chelsea Old Church.

Lastly, the confusion matrix reveals that there is an 81.25% accuracy when distinguishing between the middle-class cemetery of St. Benet Sherehog to St. Bride's Lower and Chelsea Old Church (Figure 4.26). While it is NOT statistically significant (p=0.2569), it is not substantially better than just guessing the most common category of cemetery (79.86%). These results do suggest, however, that comparing the low-status cemetery of St. Bride's Lower to the middle- and upper-class cemeteries of St. Benet Sherehog and Chelsea Old Church is more likely to discriminate between the distribution of conditions than comparing St. Benet Sherehog to St. Bride's Lower and Chelsea Old Church.

```
## Confusion Matrix and Statistics
##
##
## middle.pred other middle
##      other    336     72
##      middle     9     15
##
##                Accuracy : 0.8125
##                  95% CI : (0.7724, 0.8482)
##     No Information Rate : 0.7986
##     P-Value [Acc > NIR] : 0.2569
##
##                   Kappa : 0.2007
##
##  Mcnemar's Test P-Value : 5.623e-12
##
##             Sensitivity : 0.17241
##             Specificity : 0.97391
##          Pos Pred Value : 0.62500
##          Neg Pred Value : 0.82353
##              Prevalence : 0.20139
##          Detection Rate : 0.03472
##    Detection Prevalence : 0.05556
##       Balanced Accuracy : 0.57316
##
##        'Positive' Class : middle
##
```

Figure 4.26 Confusion matrix for the forced classification of middle/other. Note the accuracy of predicting the middle-class cemetery is 81.25%, which is marginally better than guessing the most common category of cemetery (other with 79.86%).

Forced Classification for Upper Class Cemetery

As with the previous cemeteries, three binary variables were created: low/other, middle/other, and high/other. Only one condition has a correlation score over 0.20, which is joint disease (joi) (0.2362) (Figure 4.27).

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9990 0.1845 0.0051 0.1010 0.0171 0.0455 0.0471 0.1309 0.0386 0.0986
## [11] 0.0066 0.0046 0.2362 0.0196 0.0459 0.0725 0.0070 0.0711 0.0480 0.0558
## [21] 0.0397 0.0561 0.0916 0.0496 0.0356 0.0297 0.0692
```

Figure 4.27 Forced classification of upper/other with the variable joint disease (joi) circled in orange (0.2362).

Of the high-status burials, 17.36% have joint disease while only 4.50% of burials in the other cemeteries have joint disease (Figure 4.28). The plot shows a visual representation of this distribution (Figure 4.29).

```
(tab<-table(x$upvar,x$joi))

##
##       1   2
##   1 297  14
##   2 100  21

rownames(tab)<-c("other","upper")
colnames(tab)<-c("joi-","joi+")
(prop.table(tab,1))

##
##                joi-       joi+
##   other 0.95498392 0.04501608
##   upper 0.82644628 0.17355372

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 17.642, df = 1, p-value = 2.666e-05
```

Figure 4.28 Conditional table of joint disease (joi) variable on upper/other.

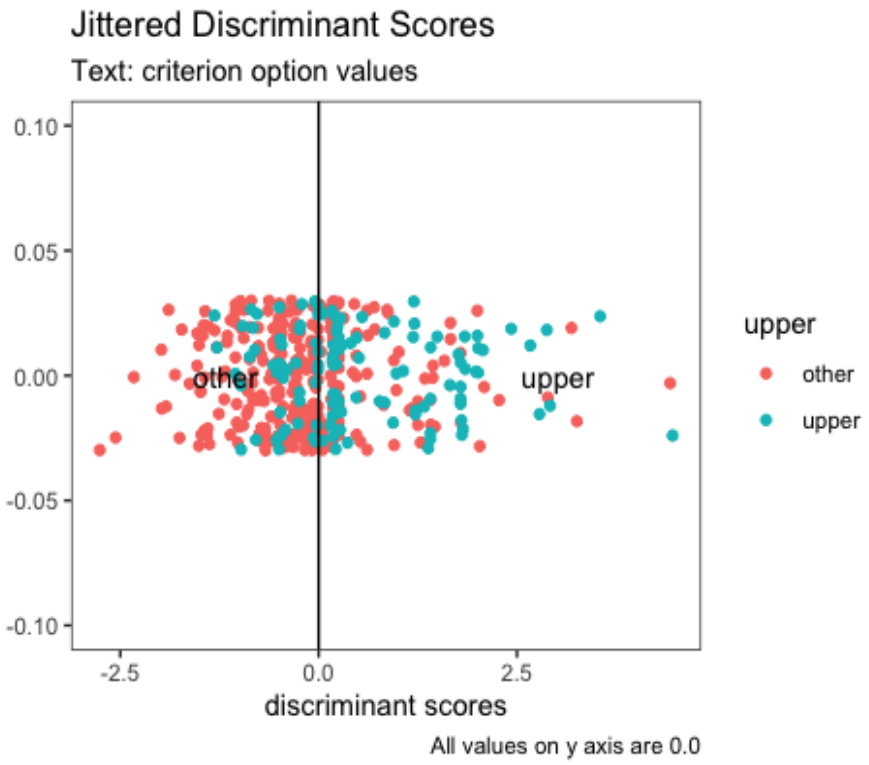

Figure 4.29 Plot of discriminant scores when determining the distribution of conditions between the upper-class cemetery of Chelsea Old Church to St. Bride's Lower and St. Benet Sherehog.

Lastly, the confusion matrix reveals that there is a 74.54% accuracy in distinguishing the presence of joint disease between the upper-class cemetery and the middle-class and low-class cemeteries, but this is not statistically significant (p=0.1298) (Figure 4.30). However, it is better than just guessing the most common category of cemetery (71.99%). As a result, comparing Chelsea Old Church to St. Benet Sherehog and St. Bride's Lower is not a recommended division.

The conclusions to be derived from this analysis indicate that there is a far greater distinction between the low-class cemetery of St. Bride's Lower from the middle-class cemetery of St. Benet Sherehog and the upper-class cemetery of Chelsea Old Church compared to any

```
## Confusion Matrix and Statistics
##
##
## upper.pred other upper
##      other   293    92
##      upper    18    29
##
##                Accuracy : 0.7454
##                  95% CI : (0.7015, 0.7858)
##     No Information Rate : 0.7199
##     P-Value [Acc > NIR] : 0.1298
##
##                   Kappa : 0.2236
##
##  Mcnemar's Test P-Value : 3.396e-12
##
##             Sensitivity : 0.23967
##             Specificity : 0.94212
##          Pos Pred Value : 0.61702
##          Neg Pred Value : 0.76104
##              Prevalence : 0.28009
##          Detection Rate : 0.06713
##    Detection Prevalence : 0.10880
##       Balanced Accuracy : 0.59090
##
##        'Positive' Class : upper
##
```

Figure 4.30 Confusion matrix for the forced classification of upper/other. Note the accuracy of predicting the upper-class cemetery is 74.54%, which is marginally better than guessing the most common category of cemetery (other with 71.9%).

other division of cemeteries. These results suggest that the sample from St. Bride's Lower represents a major difference in the pathological and traumatic variable categories compared to the middle- and higher-class cemeteries. This distinction is due to the high frequency of fractures in St. Bride's Lower compared to St. Benet Sherehog and Chelsea Old Church, which suggests that the lives of the poorest population in the sample—including occupation, labor, and everyday living—were far harsher and more unforgiving than those buried at St. Benet Sherehog and Chelsea Old Church. The remainder of the forced classification to be discussed in this chapter pertains to the four age groups presented in this thesis.

Forced Classification for 18-25 Age Group

As with the class variable, the age variable required the creation of four binary variables: age1/other (18-25), age2/other (26-35), age3/other (36-45), age4/other (>46). This section focuses on age1/other; however, because only 19 burials were identified to be between 18 to 25 years old, there are no correlation scores higher than 0.20 (Figure 4.31). The condition closest to the 0.20 threshold, cribra orbitalia (cri), generates a score of 0.1782, which will be analyzed here.

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9990 0.0755 0.1128 0.0101 0.0306 0.1782 0.0098 0.0576 0.0415 0.1272
## [11] 0.0398 0.0510 0.0226 0.0441 0.0376 0.0438 0.1793 0.0773 0.0211 0.0577
## [21] 0.0712 0.0229 0.0716 0.0494 0.0776 0.0427 0.0486
```

Figure 4.31 Forced classification of age1/other with the variable cribra orbitalia (cri) (0.1782) orange.

In the youngest age category, 36.64% of individuals have cribra orbitalia, while only 11.38% of individuals from the other age groups have the condition (Figure 4.32).

```
(tab<-table(x$age1,x$cri))

##
##       1   2
##   1 366  47
##   2  12   7

rownames(tab)<-c("other","age1")
colnames(tab)<-c("cri-","cri+")
(prop.table(tab,1))

##
##              cri-      cri+
##   other 0.8861985 0.1138015
##   age1  0.6315789 0.3684211

chisq.test(tab)

## Warning in chisq.test(tab): Chi-squared approximation may be incorrect

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 8.5647, df = 1, p-value = 0.003428
```

Figure 4.32 Conditional table of cribra orbitalia (cri) variable on age1/other.

The confusion matrix indicates that the accuracy is 95.83% when distinguishing between the youngest age group (18-25) and the other age groups (Figure 4.33). This is not statistically significant (p=0.4672) and is no better than just guessing the other age groups (95.60%).

```
## Confusion Matrix and Statistics
##
##
## age1.pred other age1
##     other   411   16
##     age1      2    3
##
##                Accuracy : 0.9583
##                  95% CI : (0.9349, 0.9751)
##     No Information Rate : 0.956
##     P-Value [Acc > NIR] : 0.467428
##
##                   Kappa : 0.236
##
##  Mcnemar's Test P-Value : 0.002183
##
##             Sensitivity : 0.157895
##             Specificity : 0.995157
##          Pos Pred Value : 0.600000
##          Neg Pred Value : 0.962529
##              Prevalence : 0.043981
##          Detection Rate : 0.006944
##    Detection Prevalence : 0.011574
##       Balanced Accuracy : 0.576526
##
##        'Positive' Class : age1
##
```

Figure 4.33 Confusion matrix for the forced classification of age1/other. Note the accuracy of predicting the youngest group is 95.83%, which is marginally better than guessing the most common category of age group (other with 95.6%).

Forced Classification for 26-35 Age Group

When analyzing the second youngest age group (26-35), the correlation table indicates that there are no variables with correlations higher than 0.20 (Figure 4.34). However, because osteoarthritis (osa) has a correlation closest to 0.20 (0.1990), this was the condition analyzed.

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9990 0.1283 0.0203 0.0182 0.1056 0.0776 0.0171 0.1010 0.0703 0.0887
## [11] 0.0688 0.0531 0.0097 0.0275 0.0231 0.0385 0.1990 0.1321 0.0401 0.0326
## [21] 0.0522 0.0362 0.0620 0.0691 0.0503 0.0206 0.0421
```

Figure 4.34 Forced classification of age2/other with the variable osteoarthritis (osa) in orange.

The condition table indicates that in the 26-35 age group, 12.73% of individuals have osteoarthritis compared to 36.40% of individuals in the other age groups (Figure 4.35).

```
(tab<-table(x$age2,x$osa))

##
##       1   2
##   1 236 141
##   2  48   7

rownames(tab)<-c("other","age2")
colnames(tab)<-c("osa-","osa+")
(prop.table(tab,1))

##
##              osa-      osa+
##   other 0.6259947 0.3740053
##   age2  0.8727273 0.1272727

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 11.901, df = 1, p-value = 0.000561
```

Figure 4.35 Conditional table of osteoarthritis (osa) variable on age2/other.

Lastly, the confusion matrix indicates that the accuracy of identifying an individual from the 26-35 age group is 87.27% (Figure 4.36). This is not statistically significant (p=0.5359) and is no better than just guessing the most common category of other age groups (87.27%).

```
## Confusion Matrix and Statistics
##
##
## age2.pred other age2
##     other   373   51
##     age2      4    4
##
##                Accuracy : 0.8727
##                  95% CI : (0.8375, 0.9026)
##     No Information Rate : 0.8727
##     P-Value [Acc > NIR] : 0.5359
##
##                   Kappa : 0.0978
##
##  Mcnemar's Test P-Value : 5.552e-10
##
##             Sensitivity : 0.072727
##             Specificity : 0.989390
##          Pos Pred Value : 0.500000
##          Neg Pred Value : 0.879717
##              Prevalence : 0.127315
##          Detection Rate : 0.009259
##    Detection Prevalence : 0.018519
##       Balanced Accuracy : 0.531059
##
##        'Positive' Class : age2
##
```

Figure 4.36 Confusion matrix for the forced classification of age2/other. Note the accuracy of predicting the second youngest group is 87.27%, which is the same as guessing the most common category of age group (other with 87.27%).

Forced Classification for 36-45 Age Group

The correlation table for the third age group (36-45) reveals that osteoarthritis has a correlation score of 0.2242, which is higher than the 0.20 threshold (Figure 4.37).

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9991 0.1078 0.1014 0.0142 0.0570 0.1100 0.0639 0.0564 0.0554 0.0526
## [11] 0.0117 0.1114 0.0528 0.0024 0.0607 0.0333 0.2242 0.1377 0.0101 0.0288
## [21] 0.0231 0.0637 0.0230 0.0698 0.0036 0.0598 0.0691
```

Figure 4.37 Forced classification of age3/other with the variable osteoarthritis (osa) in orange.

The conditional table shows that only 20.71% of individuals age 36-45 have osteoarthritis while 40.75% of individuals in the other age group have osteoarthritis (Figure 4.38).

```
(tab<-table(x$age3,x$osa))

##
##       1   2
##   1 173 119
##   2 111  29

rownames(tab)<-c("other","age3")
colnames(tab)<-c("osa-","osa+")
(prop.table(tab,1))

##
##              osa-      osa+
##   other 0.5924658 0.4075342
##   age3  0.7928571 0.2071429

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 15.994, df = 1, p-value = 6.354e-05
```

Figure 4.38 Conditional table of osteoarthritis (osa) variable on age3/other.

Lastly, the confusion matrix suggests that there is a 68.52% accuracy when identifying individuals from this age group, which is not statistically significant (p=0.3615) (Figure 4.39). Using this age group is no better than guessing from the other age groups (67.59%).

Forced Classification for >46 Age Group

The final age group, those who are 46 and older, have four variables with correlation scores higher than 0.20: ankylosis (ank) (0.2021), cribra orbitalia (cri) (0.2132), osteoarthritis (osa) (0.3896), and osteoporosis (osp) (0.2340) (Figure 4.40).

```
## Confusion Matrix and Statistics
##
##
## age3.pred other age3
##     other   266  110
##     age3     26   30
##
##                Accuracy : 0.6852
##                  95% CI : (0.6391, 0.7287)
##     No Information Rate : 0.6759
##     P-Value [Acc > NIR] : 0.3615
##
##                   Kappa : 0.1484
##
##  Mcnemar's Test P-Value : 1.101e-12
##
##             Sensitivity : 0.21429
##             Specificity : 0.91096
##          Pos Pred Value : 0.53571
##          Neg Pred Value : 0.70745
##              Prevalence : 0.32407
##          Detection Rate : 0.06944
##    Detection Prevalence : 0.12963
##       Balanced Accuracy : 0.56262
##
##        'Positive' Class : age3
##
```

Figure 4.39 Confusion matrix for the forced classification of age3/other. Note the accuracy of predicting the third youngest group is 68.52%, which is no better than just guessing the most common age group (other with 67.59%).

```
## Item correlation with total (Rjt), criterion in [1]:
##  [1] 0.9990 0.2021 0.0316 0.0040 0.1292 0.2132 0.0718 0.1338 0.1083 0.1471
## [11] 0.0354 0.1523 0.0312 0.0305 0.0553 0.0114 0.3896 0.2340 0.0285 0.0237
## [21] 0.0148 0.0425 0.0862 0.0364 0.0015 0.0252 0.1038
```

Figure 4.40 Forced classification of age4/other with the variables ankylosis (ank), cribra orbitalia (cri), osteoarthritis (osa), and osteoporosis (osp) in orange.

The first conditional table analyzes the presence of ankylosis in the oldest age group. The conditional table indicates that 12.84% of the oldest age group have ankylosis, while only 2.80% of the other age groups have the condition (Figure 4.41).

```
(tab<-table(x$age4,x$ank))

##
##       1   2
##   1 208   6
##   2 190  28

rownames(tab)<-c("other","age4")
colnames(tab)<-c("ank-","ank+")
(prop.table(tab,1))

##
##                ank-       ank+
##   other 0.97196262 0.02803738
##   age4  0.87155963 0.12844037

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 13.661, df = 1, p-value = 0.000219
```

Figure 4.41 Conditional table of ankylosis (ank) variable on age4/other.

For cribra orbitalia, the second condition of highest presence in the oldest age group, the conditional table indicates that only 5.95% of individuals over 46 years old have the condition compared to 19.16% of the other age groups (Figure 4.42).

For the third condition in the oldest age group, the conditional table indicates that 51.38% of individuals in the oldest age group have osteoarthritis, compared to only 16.82% in the other age groups (Figure 4.43)

For the last condition analyzed in the oldest age group, the conditional table indicates that 14.68% of individuals 46 years old and older have osteoporosis, compared to only 2.34% of individuals from the other age groups (Figure 4.44).

```
(tab<-table(x$age4,x$cri))

##
##       1   2
##   1 173  41
##   2 205  13

rownames(tab)<-c("other","age4")
colnames(tab)<-c("cri-","cri+")
(prop.table(tab,1))

##
##               cri-       cri+
##   other 0.80841121 0.19158879
##   age4  0.94036697 0.05963303

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 16.007, df = 1, p-value = 6.312e-05
```

Figure 4.42 Conditional table of cribra orbitalia (cri) variable on age4/other.

```
(tab<-table(x$age4,x$osa))

##
##       1   2
##   1 178  36
##   2 106 112

rownames(tab)<-c("other","age4")
colnames(tab)<-c("osa-","osa+")
(prop.table(tab,1))

##
##              osa-      osa+
##   other 0.8317757 0.1682243
##   age4  0.4862385 0.5137615

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 55.724, df = 1, p-value = 8.337e-14
```

Figure 4.43 Conditional table of osteoarthritis (osa) variable on age4/other.

```
(tab<-table(x$age4,x$osp))

##
##       1   2
##   1 209   5
##   2 186  32

rownames(tab)<-c("other","age4")
colnames(tab)<-c("osp-","osp+")
(prop.table(tab,1))

##
##                osp-       osp+
##   other 0.97663551 0.02336449
##   age4  0.85321101 0.14678899

chisq.test(tab)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tab
## X-squared = 19.46, df = 1, p-value = 1.027e-05
```

Figure 4.44 Conditional table of osteoporosis (osp) variable on age4/other.

Finally, the confusion matrix for this age group indicates that there is a 73.61% accuracy when identifying the oldest age group from the other age groups which is statistically significant (Figure 4.45). This is far greater than guessing the other age groups (50.46%).

The results of the forced classification for the age groups indicates that the age groups should be divided into two age groups: those under 46 and those over 46. This is due to the smaller number of individuals in the three youngest age groups compared to the oldest group. This age division will be used to explore the final part of the statistical analyses presented in this thesis.

```
## Confusion Matrix and Statistics
##
##
## age4.pred other age4
##     other   168   68
##     age4     46  150
##
##                Accuracy : 0.7361
##                  95% CI : (0.6919, 0.7771)
##     No Information Rate : 0.5046
##     P-Value [Acc > NIR] : <2e-16
##
##                   Kappa : 0.4727
##
##  Mcnemar's Test P-Value : 0.0492
##
##             Sensitivity : 0.6881
##             Specificity : 0.7850
##          Pos Pred Value : 0.7653
##          Neg Pred Value : 0.7119
##              Prevalence : 0.5046
##          Detection Rate : 0.3472
##    Detection Prevalence : 0.4537
##       Balanced Accuracy : 0.7366
##
##        'Positive' Class : age4
##
```

Figure 4.45 Confusion matrix for the forced classification of age4/other. Note the accuracy of predicting the oldest group is 73.61%, which is significantly better than guessing the most common category of age group (age4 with 50.46%).

Multiple Correspondence Analysis

Seven traits were revealed as having the ability to distinguish between class, age, and sex: fra, joi, den, cri, osa, ank, and osp as revealed by the results of the confusion matrixes.

In order to complement the previous analyses, eight groups were created using sex, class, and age to compare to the seven distinguishing conditions (Table 4.6). Each new group was associated with a Group Number, i.e. female/classlow/ageyoung is Group 1 while male/classhigh/ageold was designated Group 8.

Table 4.6 Combined Traits for CA

Group Number	Sex/Class/Age Combinations
Group 1	Female/classlow/ageyoung
Group 2	Female/classlow/ageold
Group 3	Female/classhigh/ageyoung
Group 4	Female/classhigh/ageold
Group 5	Male/classlow/ageyoung
Group 6	Male/classlow/ageold
Group 7	Male/classhigh/ageyoung
Group 8	Male/classhigh/ageold

Next, the middle class and high-class cemeteries were combined in order to complement the number of individuals representing the "classhigh" variables (Figure 4.46).

```
table(x$class)

##
##   1   2   3
## 224  87 121

class2<-ifelse(x$class==1,1,2)
table(class2)

## class2
##   1   2
## 224 208
```

Figure 4.46 Combination of class groups. Group 1 represents St. Bride's Lower, Group 2 represents St. Benet Sherehog, and Group 3 represents Chelsea Old Church. Once combined, Group 1 continues to represent St. Bride's Lower, but Group 2 represents St. Benet Sherehog and Chelsea Old Church.

The same was done with age: Group 1 is the three youngest age groups (18-25, 26-35, 36-45) while Group 2 is the oldest age group (>46) (Figure 4.47).

The seven conditions that can distinguish age, sex, and class were then taken and Multiple Correspondence Analysis (MCA) was performed against the eight combined Groups, with the Groups serving as the supplemental variable. Next, the results of the Joint MCA were plotted, and a chi-squared test was performed for the seven conditions to identify potential

differences between the combined categories. The following chapter will reveal the results of the statistical analyses outlined here.

```
table(x$age)

##
##   1   2   3   4
##  19  55 140 218

age2<-ifelse(x$age==4,2,1)
table(age2)

## age2
##   1   2
## 214 218
```

Figure 4.47 Combination of age groups. Group 1 represents individuals age 18-25, Group 2 represents individuals age 26-35, Group 3 represents individuals age 35-45, and Group 4 represents individuals age >46. Once combined, Group 1 represents individuals age 18 through 45, while Group 2 represents individuals age >46.

Chapter 5: Results and Discussion

Introduction

Several preparatory steps had to be taken for the statistical analyses applied in this thesis to reveal patterns regarding the distribution of pathological conditions relative to sex, age, and class. As discussed in the previous chapter, eight categories were created to include related variables that were not prevalent enough to adequately represent the sample. Prior to this consolidation, however, descriptive statistics were used to generate visual distributions of numbers of traits per person using the external variables of sex, class, and age.

Multiple Correspondence Analysis and Chi-Squared Test

The eight categories that were generated (see Chapter 4 Table 4.6) to consolidate the sex, age, and class variables were plotted after the MCA was carried out. The first plot shows the distribution of the seven conditions that are capable of distinguishing class, sex, and age (Figure 5.1). The first dimension contrasts the presence of ankylosis (ank), osteoarthritis (osa), fractures (fra), and osteoporosis (osp) to the presence of joint disease (joi), dental pathology (den), and cribra orbitalia (cri). The second dimension contrasts the presence of osteoarthritis (osa), osteoporosis (osp), and fractures (fra) to the presence of ankylosis (ank).

The following plot, Figure 5.2, reflects Figure 5.1, but instead of plotting the conditions, it plots the eight groups of demographic variables (see Chapter 4 Figures 4.1 and 4.2) (Figure 5.2). The first dimension separates the variable “old” (>46 years of age), which sits on the right side of the plot, from the variable “young” (18-25, 26-35, 36-45 of age), which sits on the left side of the plot (Groups 2, 4, 6, and 8). The second dimension separates the lower class (St.

Bride's Lower), which sits on the bottom of the plot, from the high class (St. Benet Sherehog and Chelsea Old Church), which sits on the top of the plot (Groups 1, 2, 5, and 6). On the right

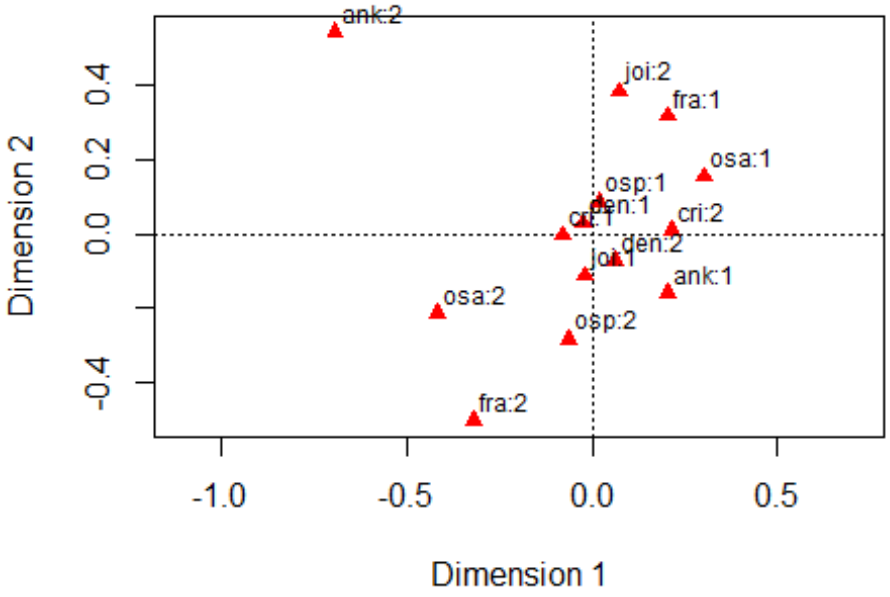

Figure 5.1 JCA plot of the seven traits that can distinguish sex, age, and class.

side of the plot, the sexes tend to be closer than on the left side of the plot, suggesting that in the older age groups, there is a greater distinction between the sexes than in the younger age groups for the conditions that are located at a greater distance from the origin of the plot (fra, osa, and ank). This distinction, however, does not appear between the low class and high-class groups.

The chi-squared tests performed revealed which conditions and groups were statistically significant and thus represent parts of the sample that demonstrated differences between the sexes in relation to the distribution of the condition of interest. Each condition is presented in tabular form to illustrates its presence and absence per individual according by sex.

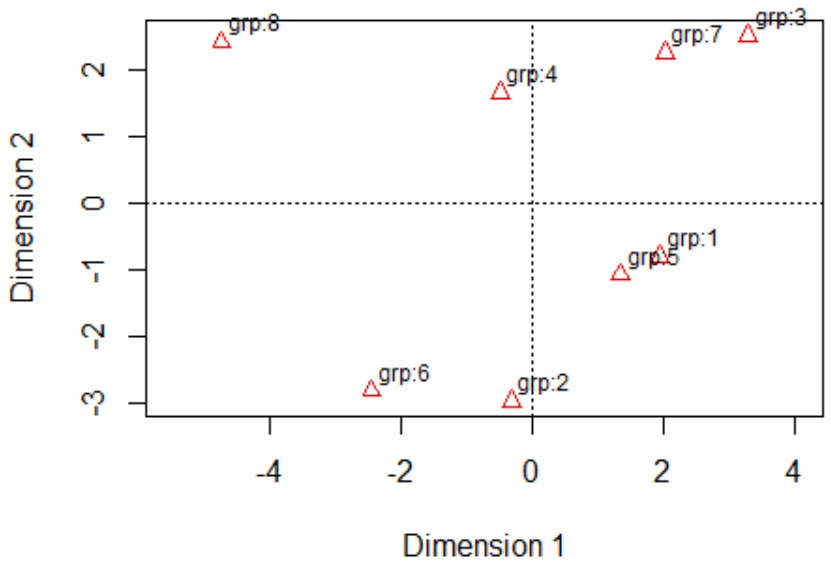

Figure 5.2 JCA plot of the eight groups reflecting the location of the seven traits in Figure 5.1

Ankylosis

The first condition analyzed, ankylosis, is characterized by fusion of bone at locations of articulation and is often attributed to an underlying disease (Powers 2012: 48; White et al. 2012:443). Some conditions that can trigger ankylosis include "long-standing or recurring osteomyelitis of adjacent bones, septic arthritis, trauma, and some erosive arthropathies (e.g. spondyloarthropathies, rheumatoid arthritis)" (Kacki et al. 2013:274). The distribution of the presence and absence of ankylosis in the sample is presented below (Table 5.1).

Table 5.1 Distribution of ankylosis

Group Number	Sex/Age/Class Combination	Ankylosis Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	35	0
Group 2	Female/classlow/ageold	51	0
Group 3	Female/classhigh/ageyoung	41	1
Group 4	Female/classhigh/ageold	41	5
Group 5	Male/classlow/ageyoung	61	1
Group 6	Male/classlow/ageold	68	8
Group 7	Male/classhigh/ageyoung	71	4
Group 8	Male/classhigh/ageold	30	15

The combination of class and age, as seen in Table 5.1, was used to determine if a sex difference was present in each sample. Sex differences were observed between four groups in the ankylosis sample: Group 2 and Group 6, and Group 4 and Group 8. Group 2 and Group 6 are comprised of old individuals (>46 years of age) from the low-class cemetery of St. Bride's Lower. Group 2 represents old (>46 years of age) females from St. Bride's Lower, while Group 6 represents old (>46 years of age) males from St. Bride's Lower. The p-value generated for this chi-squared test is 0.04327, which is lower than the p-value threshold of 0.05, making the sex difference statistically significant (Figure 5.3); thus, men over 46 years old from St. Bride's Lower are more likely to exhibit signs of ankylosis.

```
chisq.test(tmp)

## Warning in chisq.test(tmp): Chi-squared approximation may be incorrect

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 4.0847, df = 1, p-value = 0.04327
```

Figure 5.3 Chi-squared test of ankylosis for old, low class individuals. Note the p-value makes the results statistically significant.

Groups 4 and 8 are comprised of old (>46 years of age) females from Chelsea Old Church/St. Benet Sherehog and old (>46 years of age) males from Chelsea Old Church/St. Benet Sherehog, respectively. The p-value from this chi-squared test is 0.01959, lower than the 0.05 threshold, making the sex differences statistically significant (Figure 5.4); thus, men over 46 years old from St. Benet Sherehog and Chelsea Old Church are more likely to exhibit signs of ankylosis.

```
chisq.test(tmp)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 5.4481, df = 1, p-value = 0.01959
```

Figure 5.4 Chi-squared test of ankylosis for old, high class individuals. Note the p-value makes the results statistically significant.

The remainder of the groups, Group 1 for young (18-45 years of age) females and Group 5 for young (18-45 years of age) males in the lower class cemetery of St. Bride's Lower, and Group 3 for young (18-45 years of age) females and Group 7 for young (18-45 years of age) males in the high-class cemeteries of St. Benet Sherehog and Chelsea Old Church, were not considered statistically significant and exhibited no sex differences.

Osteoarthritis

There were no statistically significant groupings in the sample for osteoarthritis. The following table shows the distribution of the condition between the eight groups (Table 5.2).

Table 5.2 Distribution of osteoarthritis

Group Number	Sex/Age/Class Combination	Osteoarthritis Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	27	8
Group 2	Female/classlow/ageold	26	25
Group 3	Female/classhigh/ageyoung	37	5
Group 4	Female/classhigh/ageold	23	23
Group 5	Male/classlow/ageyoung	51	11
Group 6	Male/classlow/ageold	39	37
Group 7	Male/classhigh/ageyoung	63	12
Group 8	Male/classhigh/ageold	18	27

Fractures

Four groups are statistically significant in the sample when analyzing for fractures. Fracture locations included the ribs, limbs (radii, tibiae, fibulae, femora, ulnae, and humeri), nasals, sternum, tarsals and carpals, phalanges, and clavicles, among others. The table below shows the distribution of fractures among the eight groups (Table 5.3).

Table 5.3 Distribution of fractures

Group Number	Sex/Age/Class Combination	Fractures Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	25	10
Group 2	Female/classlow/ageold	38	13
Group 3	Female/classhigh/ageyoung	41	1
Group 4	Female/classhigh/ageold	39	7
Group 5	Male/classlow/ageyoung	40	22
Group 6	Male/classlow/ageold	36	40
Group 7	Male/classhigh/ageyoung	60	15
Group 8	Male/classhigh/ageold	30	15

Groups exhibiting statistically significant differences are Groups 3 and 7, which represent young (18-45 years of age), high class females from St. Benet Sherehog and Chelsea Old Church, and young (18-45 years of age), high class males from St. Benet Sherehog and Chelsea Old Church, respectively. The p-value for Groups 3 and 7 is 0.0173, less than the 0.05 threshold and statistically significant (Figure 5.5); thus, men from age 18 to 45 from St. Benet Sherehog and Chelsea Old Church are more likely to exhibit signs of fractures.

The other two groups that are statistically significant are Groups 2 and 6, which represent old (>46 years of age), low class females from St. Bride's Lower, and old (>46 years of age), low class males from St. Bride's Lower, respectively. The p-value for Groups 2 and 6 is 0.004275, which is below the threshold of 0.05, making the differences statistically significant

```
chisq.test(tmp)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 5.6659, df = 1, p-value = 0.0173
```

Figure 5.5 Chi-squared test of fractures for young, high class individuals. Note the p-value makes the results statistically significant.

(Figure 5.6); thus, men over 46 years old from St. Bride's Lower and more likely to exhibit signs of fractures.

```
chisq.test(tmp)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 8.1633, df = 1, p-value = 0.004275
```

Figure 5.6 Chi-squared test of fractures for old, low class individuals. Note the p-value makes the results statistically significant.

Osteoporosis

Two groups in the sample for osteoporosis are statistically significant. Below is the table showing the distribution of osteoporosis in the sample (Table 5.4).

Table 5.4 Distribution of osteoporosis

Group Number	Sex/Age/Class Combination	Osteoporosis Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	34	1
Group 2	Female/classlow/ageold	37	14
Group 3	Female/classhigh/ageyoung	40	2
Group 4	Female/classhigh/ageold	38	8
Group 5	Male/classlow/ageyoung	61	1
Group 6	Male/classlow/ageold	68	8
Group 7	Male/classhigh/ageyoung	74	1
Group 8	Male/classhigh/ageold	43	2

The two groups that are statistically significant are Groups 2 and 6, which represent females and males from St. Bride's Lower who were over 46 years old, respectively. The p-value for Groups 2 and 6 is 0.02565, which is below the threshold of 0.05, making the differences statistically significant (Figure 5.7); thus, females who are over 46 years old from St. Bride's Lower are more likely to exhibit signs of osteoporosis.

```
chisq.test(tmp)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 4.9795, df = 1, p-value = 0.02565
```

Figure 5.7 Chi-squared test of osteoporosis for old, lower class individuals. Note the p-value makes the results statistically significant.

Joint Disease

There were no statistically significant groups in the sample when analyzing for joint disease, which was coded in this thesis as follows: destruction of joints, pitting at points of articulation, abnormal degradation of joint surfaces, osteophytic lipping, and lesions (WORD database, 2020). The table below shows the distribution of joint disease in the sample (Table 5.5).

Table 5.5 Distribution of joint disease

Group Number	Sex/Age/Class Combination	Joint Disease Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	35	0
Group 2	Female/classlow/ageold	51	0
Group 3	Female/classhigh/ageyoung	38	4
Group 4	Female/classhigh/ageold	35	11
Group 5	Male/classlow/ageyoung	62	0
Group 6	Male/classlow/ageold	76	0
Group 7	Male/classhigh/ageyoung	60	15
Group 8	Male/classhigh/ageold	40	5

Cribra Orbitalia

There were no statistically significant groups in the sample when analyzing for cribra orbitalia (Table 5.6).

Table 5.6 Distribution of cribra orbitalia

Group Number	Sex/Age/Class Combination	Cribra Orbitalia Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	25	10
Group 2	Female/classlow/ageold	49	2
Group 3	Female/classhigh/ageyoung	31	11
Group 4	Female/classhigh/ageold	40	6
Group 5	Male/classlow/ageyoung	54	8
Group 6	Male/classlow/ageold	74	2
Group 7	Male/classhigh/ageyoung	63	12
Group 8	Male/classhigh/ageold	42	3

Dental Pathology

Two groups exhibited statistical significance in the sample when analyzing for dental pathology, which included pipe facets, general wear of the teeth including underbite and overbite wear, caries, discoloration of enamel, enamel hypoplastic pits and banding, edentulism, impacted teeth, and the congenital absence of teeth (WORD database, 2020). The following table shows the distribution of dental pathology in the sample (Table 5.7).

Table 5.7 Distribution of dental pathologies

Group Number	Sex/Age/Class Combination	Dental Pathology Distribution	
		Absent	Present
Group 1	Female/classlow/ageyoung	33	2
Group 2	Female/classlow/ageold	49	2
Group 3	Female/classhigh/ageyoung	38	4
Group 4	Female/classhigh/ageold	38	8
Group 5	Male/classlow/ageyoung	51	11
Group 6	Male/classlow/ageold	66	10
Group 7	Male/classhigh/ageyoung	55	20
Group 8	Male/classhigh/ageold	38	7

Groups 3 and 7 exhibited statistical significance between the sexes when analyzing for dental pathology. Group 3 represents young (18-45 years of age), high class females from St. Benet Sherehog and Chelsea Old Church, while Group 7 represents young (18-45 years of age), high class males from St. Benet Sherehog and Chelsea Old Church. The p-value for Groups 3 and 7 is 0.04951, which is below the 0.05 threshold, making the differences statistically significant (Figure 5.8); thus, men between the ages of 18 to 45 from St. Benet Sherehog and Chelsea Old Church were more likely to show signs of dental pathologies.

```
chisq.test(tmp)

##
##  Pearson's Chi-squared test with Yates' continuity correction
##
## data:  tmp
## X-squared = 3.8581, df = 1, p-value = 0.04951
```

Figure 5.8 Chi-squared test of dental pathology for young, high class individuals. Note the p-value makes the results statistically significant.

The remainder of this chapter will discuss the results presented above with the goal of understanding how the statistical evidence can be interpreted using a combined bioarchaeological and gender theory approach supplemented by literary sources from the English Long Eighteenth Century.

Results

Multiple Comparisons Problem

The problem of multiple comparisons arose in this thesis due to the number of conditions examined; a means of circumnavigating them will be discussed in Chapter 6. Initially it was assumed that the best way to approach the hypotheses proposed in the Introduction would be to examine the largest number of conditions possible via the criteria discussed in Chapter 4, in

anticipation that more conditions would yield more data to analyze. However, in order to examine the conditions after performing forced classification on the demographic variables of age, sex, and class status, eight groups had to be generated to compartmentalize the variables more efficiently, as discussed in Chapter 5. This resulted in 208 comparisons being conducted in total, which led to the appearance of statistical significance due to the problem of multiple comparisons. Furthermore, what became apparent in analyzing the results was that out of the 26 conditions examined, only seven conditions could distinguish between class, age, or sex (fractures, osteoarthritis, osteoporosis, cribra orbitalia, joint disease, dental pathology, and fractures), and of those seven conditions, only two were able to significantly differentiate between the sexes (fractures and osteoporosis). The large number of conditions included in the initial phase of the analysis were unnecessary as only those two conditions showed genuine statistical significance. The other conditions that *appeared* to exhibit significance (ankylosis and dental pathologies) only showed significance due to the multiple comparisons problem. The remainder of this thesis therefore will examine only osteoporosis and fractures due to these two conditions exhibiting statistically significant differences between the sexes in this sample.

Distribution of Conditions between Sex, Class, and Age Variables

There is a statistically significant difference between males and females in the distribution of conditions overall. As detailed in Figure 5.1, males exhibit a higher number of traits per individuals than females. This result, which does not account for class or age, aligns with the working hypothesis of this thesis, which stated that males should be impacted at a far greater rate than females due to their roles as physical laborers and protectors of their families as they were engaged in potentially dangerous activities outside the domestic sphere. Females, on the other hand, were expected to be less susceptible to pathologies and trauma due to the social

expectations placed on them to remain out of the high-risk, formal workforce while caring for the home and family.

The distribution of conditions per individuals in relation to the class variable reveals fascinating patterns. As shown in Figure 5.3, individuals from the poorest cemetery in the sample, St. Bride's Lower, exhibited the most conditions per individual. The only exception to this was individuals with six or more conditions who were predominantly from Chelsea Old Church. Individuals from the middle-class cemetery of St. Benet Sherehog exhibited the smallest number of traits per person overall. In the group with five conditions per individual, the distribution in descending order is as follows: St. Bride's Lower, St. Benet Sherehog, and Chelsea Old Church. What's particularly interesting is that Chelsea Old Church has the highest number of individuals with six or more traits, suggesting that despite their wealth, the richest individuals in the sample were highly susceptible to many pathological and traumatic conditions. The distribution of number of traits to class in individuals from St. Bride's Lower as well as Chelsea Old Church reveals how certain pathological and traumatic conditions are indiscriminate and can impact individuals regardless of class status or resource access.

Additionally, as seen in Figure 5.5, which represents the age variable, individuals who were >46 years of age had the greatest number of conditions compared to individuals of all younger groups. The number of conditions per individual decreases in descending order of age, with individuals aged 36-45 years exhibiting the second largest number of conditions, followed by individuals between 26-35 years of age, and individuals between 18-25 years of age, who exhibited the smallest number of conditions. No individuals aged 18-25 or 26-35 exhibited more than four conditions per individual; only individuals from the 36-45 and >46-year groups exhibited four or more conditions. This suggests that the oldest individuals in the sample coped

with the most pathological and traumatic stress, and by association potential environmental, occupational, and nutritional stress. By doing so, the oldest individuals in the sample were resilient enough to overcome several conditions during their lifetimes, surpassing their younger counterparts, many of whom died between the ages of 18 and 35 across all three cemetery populations. While the small sample size for individuals aged 18-25 should be noted, the combined youngest age groups included in the statistical analyses (18-25, 26-35, and 36-45 versus >46) indicates that those older than 46 were able to outlast the youngest populations despite a greater lifetime of accumulated pathological load.

This observation requires an understanding of the osteological paradox. Proposed by Wood et al. (1992), the osteological paradox states that individuals with lesions were not necessarily unhealthy, but rather were resilient because they survived the diseases that produced the lesions. Those who contracted diseases but did not survive to develop lesions were less resilient (Wood et al. 1992:352). While the osteological paradox has been criticized by some because it does not account for the cultural contexts that impact the human body (Goodman 1993:281), biocultural approaches can be used to account for any gaps in the theory of the osteological paradox (Siek 2013:95). If the osteological paradox is rejected, it could be argued that the oldest individuals in the sample, who accounted for those with the most conditions per person, were in fact more susceptible to disease and injury, thus resulting in a high number of conditions, while the youngest individuals in the sample were in fact the healthiest because their bodies showed the fewest pathological lesions.

Sex Differences: Fractures and Osteoporosis

The conditions that exhibited statistically significant sex differences will be discussed below. The goal of this section is to understand how the presence of conditions that exhibited sex

differences allow us to interpret how sociocultural and behavioral forces may have contributed to the patterns of these conditions in the demographic profiles of the study sample.

Fractures

Fractures comprised one of two conditions that exhibited true statistical significance between the sexes not due to the multiple comparisons problem. Specifically, males showed disproportionate more signs of fractures than females across all socioeconomic categories.

Group 3 and Group 7, which consisted of females and males, respectively, aged 18 through 45 from the St. Benet Sherehog and Chelsea Old Church cemeteries, exhibited a statistically significant difference in fractures. For the individuals from Chelsea Old Church and St. Benet Sherehog, the prevalence of fractures among young individuals suggests that the risk of injury—both occupational and personal—was a very real danger for the youngest and wealthiest in the sample. Fractures of the ribs, metacarpals, ulnae, humeri, and tibiae were present in the sample. The only female represented appears to have a fracture on the right second metacarpal; the remaining fifteen members of the sample—all males—exhibit signs of the aforementioned fractures. The sole female in the sample, Individual 232 from Chelsea Old Church, may have been unable to use the proximal phalanx of her third metacarpal, as indicated by her shortened and atrophied third metacarpal and phalanx (WORD database, 2020) (Figure 5.9). While the database does not suggest how this injury may have occurred, its presence nonetheless suggests that traumatic injury and its consequences were realities for individuals even in the wealthiest population in the sample.

Figure 5.9 Fracture of M2 of Individual 232 from Chelsea Old Church (WORD database, 2020).

Groups 2 and 6, which consist of females and males, respectively, aged 46 and up from St. Bride's Lower, also exhibited statistically significant differences between the sexes. In this sample thirteen females and forty males had fractures—a number far higher than that of Chelsea Old Church and St. Benet Sherehog. Locations of fractures include femora, metatarsals and metacarpals, ribs, nasal bones, and the femorotibial joint (Figure 5.10).

As in the Chelsea Old Church and St. Benet Sherehog sample, males exhibited far higher rates of fractures than females, indicating that men were exposed to greater physical dangers than women in this group as well. What is particularly interesting about this sample, however, is not only the sex distribution, but the ages of the individuals. Given what is known about those buried at St. Bride's Lower, the strenuous living conditions of the poor would, in many cases, lead one to presume that those in the most economically and environmentally vulnerable positions would

Figure 5.10 Fracture of right femur of Individual 1200 from St. Bride's Lower (WORD database, 2020).

succumb to their injuries and diseases at a far younger age. However, given the large number of individuals with fractures in the poorest and oldest sample, it can instead be argued, using the osteological paradox, that these individuals coped with their trauma past the age of 45. While there may have been higher mortality and morbidity rates in urban London during this time (Rudé 1971:5), the individuals in this sub-sample reveal the resiliency of the oldest individuals in the St. Bride's Lower sample as a whole.

Osteoporosis

Osteoporosis, the second and final condition to exhibit statistically significant differences by sex, was seen in only two groups, Groups 2 and 6, which represent females and males, respectively, who are 46 and older from St. Bride's Lower. Of the 127 individuals in the sample, 8 males and 14 females exhibited signs of osteoporosis. Twelve of the females exhibited signs of osteoporosis of the spine, a susceptible point of the body due to the high amounts of trabecular tissue, which has a significant turnover rate (Agarwal 2019:399) (Figure 5.11). Six of the eight males exhibited osteoporosis of the spine; two of these individuals also exhibited osteoporosis of the radius, specifically near Colles' fractures.

Figure 5.11 Osteoporosis of L4 of Individual 1954 from St. Bride's Lower (WORD database, 2020).

Osteoporosis can develop due to several causes, including menopause, inadequate access to nutrition, genetic predisposition, and lactation practices (Agarwal 2019:389). Given the age

range of the individuals in the sample, it could be argued that a majority of the females with osteoporosis developed it due to age-related changes such as menopause, possibly combined with lactation practices. Long-term osteoporosis of the spine causes compression fractures, which then turns into secondary kyphosis (Ortner and Putschar 1985:289). This is seen in one of the females in the sample, specifically Individual 1127, who exhibited signs of kyphosis as well as vertebral lipping and fusions of T4 through T6 (WORD database, 2020). As Ortner and Putschar explain, localized osteoporosis often results from relief of mechanical stress on the body due to "disuse, pain, trauma, infection or disturbed innervation" (1985:290). As the body is a representation of a lifetime of biocultural experiences, including stress and trauma, nutritional access or lack thereof, and environmental exposure, the individuals in the sample represent the lived experiences of women who were not only faced with biocultural pressures to bear and raise children, age, and experience menopause, but, for those in the lower classes, were afflicted with the socioeconomic stressors of poor sanitary living conditions, lack of adequate nutrition, and diseases that can exacerbate the onset of bone frailty and osteoporosis.

Discussion

The general trend of the analysis of conditions in the study sample indicates that trauma and disease were largely not class specific. Literature from the English Long Eighteenth Century is used as a supplementary source to understand how gender norms and expectations were being created and reinforced in London during this time, and if these social expectations were reflected in the bioarchaeological record presented here for fractures and osteoporosis.

The literature of the Long Eighteenth Century extensively describes the experiences and expectations of English society in novels, guidebooks, newspapers, and magazines and can aid in the analysis of the results generated by this thesis. As explained by John Marx in *A Companion*

to the English Novel (2015), the novel is a representation of community both nationally and locally, in that all individuals who experience the characters, settings, and plots of a novel in a private sphere wind up experiencing a direct connection to the public sphere and the greater world around them (Marx 2015:427-428). How one experiences the world of a novel is not only highly intimate but also communal; while the novel reflects an image of the world around it, it pulls in an individual reader to experience it personally. Because of the liminal space that novels inhabit—both private and public—such sources serve as reflections of the worlds around them while also privately expressing a fictional tale to the reader that can influence how the reader experiences the world.

The lived experiences of those in the sample populations examined here were embedded into their bodies after death; their experiences, too, are a result of how society created and dictated social rules and order. Richetti (1985:5, 2015:93) has argued that the English novel of the eighteenth century reflects reality, including socioeconomic struggles, power, and social order. If that statement is true, it should be possible to use English literature from the Long Eighteenth Century to explain how social roles and identities, including gender, class, and age, came to be enacted and embodied over the life course of each individual studied in this thesis.

The mere act of writing itself and the content created by writers can reveal how a society segmented gender roles and expectations on a macro- to micro-level. As people across all class lines learned how to read, often from childhood—contradicting previous beliefs about who had access to literature and education in the period in question—the most vulnerable individuals across populations gained the opportunity to experience new worlds of thought (Bannet 2013:122). For example, women's periodicals, like *The Lady's Magazine, or Entertaining Companion for the Fair Sex*, were used by many women during the 18th century as a source of

information about “travel literature, sermons, and lectures on a wide range of topics” that were far from considered “light reading” (Miller 1971:281). However, given the fact that *The Lady’s Magazine* was originally written by men and not women, many issues neglected content central to women’s interests, such as love stories, fashion, and content pertinent to female education (Miller 1971:281). Because so many women, specifically among the middle class, had the ability to read and were attracted to such periodicals, their content began to shift and served to entertain women with their articles on “love, dress, fashionable vices, and female education” (Miller 1971:281). As women began to take more control over their social and personal lives, the intimate experience of reading turned into a highly public one in which women could share their concerns and receive advice from writers for the magazine (Miller 1971:281).

While the development of the periodical is considered to have accompanied improved standards of living and greater access to education, criticism of such periodicals and women’s access them devalued literature as a whole and the cultural capital of such written texts was debased due to the “instant gratification” they provided to their readers (Miller 1971:283-284). Despite helping to commercialize literature, women’s contributions to the social reading world devalued reading overall; this depreciation of the mere act of reading reveals how patriarchal criticisms of women’s education and social advancement restricted such activities to “the cultivated few” (Miller 1971:283). Other areas of literature, such as autobiographies, were also male dominated until women’s entry into the genre forced private lives into the public sphere (Culley 2015:3). However, autobiographies were also dismissed by the mainstream as “dishonest and lacking formal coherence” (Culley 2015:3). Novels by women authors were considered to fall within socially accepted boundaries, and it was in these novels, too, that women were able to transcend sociopolitical barriers while remaining within the realm of patriarchal acceptance.

Like women, men also had access to literature that provided guidance and structure. The men's version of *The Lady's Magazine* was *The Gentleman's Magazine*, which was in circulation from 1731 to 1922; however, the issues from 1785-1815 are the ones that are especially significant for this study due to the debate surrounding the crystallization of class tension occurring during this time in England (Stafford 2009:65).

The Gentleman's Magazine documented obituaries, births and marriages, as well as other interactions and discussions pertaining to London society at the time. However, it is not just the content of the magazine that is of interest to this thesis. Who contributed to *The Gentleman's Magazine* can be used to reconstruct how men were directed to live by other men during this time period. For example, the primary contributors to the magazine were educated men, including writers, teachers, and librarians, followed by clergymen, emphasizing the type of learned and cultured men who wrote for the publication (Stafford 2009:67). Because of these demographics, the writers of the magazine made a distinction between the gentility of the educated compared to the inferiority of the non-educated, such as tradesmen and merchants; it was here that access to money and how one spent it contributed significantly to class distinctions and gentlemanly behavior (Stafford 2009:76-77). To be viewed as a proper gentlemen, spending one's money wisely, which usually included spending money on "a country house, donations to charities, open and generous hospitality, a family burial vault, and appropriate testamentary arrangements", was seen as more gentlemanly than not spending one's money in such a way (Stafford 2009:77). Not only were money and wealth highly coveted for increased social status, but how one used one's money and wealth contributed significantly to how men were perceived.

In order to avoid criticism and social persecution, men had to be properly educated, engage in certain occupations, and spend their money in particular ways; those who could not do

such things were viewed as socially inferior, or on the "plain" below the plateau that the genteel resided up on (Stafford 2009:82). As Stafford (2009:82) explains, the poor were not seen as people, but as objects to be patronized and gawked at. These standards were reinforced by *The Gentleman's Magazine* as a means of solidifying class stratification, even if the magazine itself refused to acknowledge class conflict in order to quell any potential uprisings by the lower and working classes during periods of warfare and political upheaval (Stafford 2009:87). Regardless of the realities that the magazine refused to acknowledge, however, the contributors, readers, and content represented by such a far-reaching publication reveals how wealthy men perceived one another and those socially "beneath" them, reinforcing stereotypical expectations of their sex that were simultaneously dependent on class status.

It can be argued that the general dismissal of women's contributions to literature mirrors a larger societal dismissal of women's contributions to society as a whole apart from their obvious reproductive roles. As sociopolitical experiences were often reflected in literature (Mason and Smallwood 2000:193), this provides a way of interpreting the distribution of conditions among the sample. Men exhibited statistically significant differences in fractures compared to women in the study sample, while women exhibited statistically significant differences in osteoporosis, which is the only condition in the sample that stems from biological and sociocultural stressors. How literature discusses men and women and describes their expectations and behaviors may help to elucidate the lived experiences of the individuals in the sample. However, only osteoporosis and fractures will be explored further here as they are the only two conditions exhibiting statistically significant differences between the sexes. The issue of ankylosis and dental pathologies, which exhibited statistically significant differences between the sexes due to the problem of multiple comparisons, will be discussed in Chapter 6 in order to

present potential solutions to the analytical issues that this thesis faced and how future research might resolve this issue.

Women and Osteoporosis

The osteoporosis variable exhibited statistically significant differences between the sexes but not between classes, with the condition favoring older females more than males or females from any other age categories. While osteoporosis should not be solely considered a "female" condition because of its many etiologies, in the case of the sample examined here, it is reasonable to consider the possibility that female-centric biocultural and sociocultural hurdles, such as lack of proper nutrition, pregnancy and lactation, and menopause all contributed to the development of bone frailty, the latter three being female-exclusive traits. While class undoubtedly contributed to what is known historically about how wealthy and poor women navigated their biocultural experiences as females, such as wealthy women using wet nurses and nursemaids to feed their infants (Newman and Gowland 2017:224-225), while poor women were required to breastfeed, thus making them more susceptible to bone frailty over time, the condition examined in this sample crossed socioeconomic boundaries, suggesting that the women from St. Bride's Lower, St. Benet Sherehog, and Chelsea Old Church shared more similarities than differences when it came to the etiological development of osteoporosis.

Viewed from a binary perspective, it can be argued that risk factors associated with osteoporosis for women compared to men varies, given that women are the only ones to undergo the stress of pregnancy, lactation, and menopause. While men and women from all three cemeteries were affected in some way by every condition included in this analysis, the only statistically significant condition where females dominated was osteoporosis. This aligns with the expected gender roles at the time, which heavily focused on the importance of bearing and

raising children. However, women from most socioeconomic groups would have engaged in some physical labor in and around the home. For example, women from even the highest rungs on the socioeconomic ladder in the 17th and 18th centuries England, specifically those dubbed mistresses of the house, were performing domestic duties around the home, including preparing sweetmeats and medicinal remedies; this was particularly true for rural ladies (Lehmann 2005:17; Rouyer-Daney 2005:32). This labor could contribute to the onset of certain conditions, such as osteoarthritis, but not necessarily osteoporosis.

While making sweetmeats and medicine was not as physically daunting as certain tasks many middle-class and poor women had to engage in, the fact that upper-class women regularly engaged in domestic roles around the home indicates that women of all socioeconomic classes were not expected to completely avoid some forms of labor. However, women from lower socioeconomic classes were forced into far more labor-intensive roles that were both sociocultural and biocultural. Women from the middle- and lower-classes, especially single or widowed women, were often found working outside the home, particularly in public economies that involved trading, shop keeping, and working in guilds (Simonton 2005:103-104). Working women in particular were often depicted in art from the Long Eighteenth Century as shopkeepers, street sellers, and most popularly, milkmaids (Baudino 2005:178-180). However, the depiction of women as milkmaids tended to downplay the intense physicality of their work, which required hauling large pails of milk through the London streets after waking at sunrise to travel to cow pastures to retrieve the milk in the first place (Baudino 2005:180). Instead, artwork from the time showed milkmaids as dainty, graceful, and hyper-feminine; this is particularly noticeable in William Hogarth's *The Enraged Musician* (1741) (Baudino 2005:179-180) (Appendix F). However, Hogarth, albeit subtly, did not neglect the physicality necessary to be a

working woman in 18th century London, as his piece entitled *Morning* (1738), from his series *The Four Times of Day* (1736), illustrates (Appendix G). In this piece, on the far left-hand side, a large woman is depicted holding a sizeable basket of wares to be sold while the remaining women in the engraving are being treated as prostitutes by men. As Baudino (2005:181) notes, however, artists often either idealized the portrayal of working women, as seen in *The Enraged Musician* (1741), or mocked them and their bodies, as seen in *Morning* (1738).

By considering the possibility that women in 18th century London were not the delicate creatures depicted in literature (Baudino 2005:182), the experiences of the women examined in this thesis are situated in a complicated location that demands nuance and understanding so as to not neglect any potential avenues of analysis. While it can be argued that the women in this sample were merely conforming to their expected gender roles as bearers and caretakers of children, as well as suffering from the inevitable consequences of aging and menopause resulting in the high incidences of osteoporosis in the sample, this answer is too simple. Osteoporosis should not be solely considered a female-centric condition that primarily or solely impacts women even though women in this study did exhibit a greater incidence of this condition. That assertion only reinforces stereotypical gender norms and projects contemporary medical and pathological perceptions of the disease onto the past, thus obscuring how researchers interpret how past peoples lived as they are depicted through a modern lens. The presence of osteoporosis in women in this sample does not negate that argument, however; it is a testament to biocultural realities that many women faced during this time, as the assertion that women must be relegated to the private sphere came to prominence in Western Europe. Bearing and raising children are not strictly biological processes—they are also sociocultural processes that reveal how women were perceived and how they were expected to behave. The presence of osteoporosis in this

sample also shows how some women at least overcame the dangers of infancy and adolescence, grew to adulthood, survived the perils of childbirth, and made it to old age where the primary onset of menopause could occur. While there are many issues with osteoporosis being perceived as a "female condition", there is a considerable value in understanding how women are affected by the condition, and what the overwhelming presence of it in a sample may reveal about the lived biocultural and sociocultural experiences of womanhood during this time.

Another potential way that women could have been susceptible to osteoporosis was due to chronic alcohol consumption. The gin epidemic in England during the 18th century affected men and women alike, especially among the working classes (Warner et al. 2001:375). While men tended to consume alcohol at higher rates than women (Mikosch 2014:16), England's gin and distilled spirits epidemic may explain the increased presence of osteoporosis in women around this time. Ethanol causes impairment in bone remodeling, decreasing the number of osteoblasts in bone via reduced cell development (Mikosch 2016:16). As a result of this cell development imbalance, alcohol abuse can cause an increased rate of fractures, specifically of the vertebrae and iliac crest (Mikosch 2014:20; Ulhøi 2017:134). Visual depictions of this epidemic can be seen in William Hogarth's *Gin Lane* (1751), which depicts men and women engaging in depraved behavior fueled by alcohol, including a woman dropping her baby off a set of stairs in an act of infanticide (Appendix H).

Women's predisposition to osteoporosis due to biological factors such as pregnancy, breastfeeding, and menopause also predisposed them to bone frailty. However, women's experiences in this sample cannot be seen as monolithic, as osteoporosis appeared in all three cemeteries and thus was affecting women regardless of class status. For example, women from St. Bride's Lower likely ran into other barriers aside from biocultural ones, such as a lack of

access to healthy foods and proper sanitation, which made living a healthier and safer life difficult. However, these female-specific barriers also existed, further complicating survival conditions for poor women. For example, circumstances surrounding childbearing, including prolonged breastfeeding to avoid buying food (Newman and Gowland 2017:225), or ceasing breastfeeding to dry feed infants so women could return to work sooner (DeWitte et al. 2015:248) were likely experienced by many of the women in the St. Bride's Lower sample given what is known of poor women's lives in industrialized London. For single and unmarried women in particular, the dangers surrounding childbirth not only would have affected the mothers, but the children born to them as well; this can speak to how infants and children were cared for and raised by those in the lowest rungs of society and the long-term risks for both mother and child. For example, single and unmarried women who had just given birth would not have been able to rest for a long time if they did not give birth in hospitals or workhouses (Williams 2011:79). In the case of one woman named Emma Riley, after leaving the workhouse two weeks after giving birth, she found herself with an insufficient amount of breastmilk due to living in poverty and her emaciated child died (Williams 2011:80). Not only did these behaviors impact the women engaging in the biosocial behavior of pregnancy and breastfeeding, but as seen in the aforementioned example, infants affected by breastmilk of poor nutritional value and/or dry feeding would be exposed to diarrheal diseases that could cause a predisposition to bone frailty or even death in early childhood (Mays 2001:40). With lower middle-class and poor working women being unable to hire help to care for their children (Gordon and Nair 2006:553), women from the lower classes were disproportionately exposed to biocultural and sociocultural stressors that, as seen in the sample population examined here, left signs of physical stress and lesions on the body.

Women's expected roles as childbearers and caretakers of the family align with the literature from the time that segregated women from the public sphere and restricted them to the private, domestic sphere. However, women across class lines were working in and around the home *and* were afflicted with osteoporosis. What was expected of them by society was directly in conflict with what was realistically necessary for them to do to survive. Women in the literature examined in previous chapters were either strictly relegated to the private sphere, as in *The Ladies Calling* by Richard Allestree (1673) (see Chapter 3), or they acquired social and political mobility for a brief time before returning to their required social roles, as seen in the works of Charlotte Lennox (1752), Aphra Behn (1679), and Daniel Defoe (1724, 1722), where women remained relegated to roles that required submission to the dominant gender ideology.

In English novels and other forms of literature, perceptions of women ranged from highly conservative to progressive or even proto-feminist. As discussed in Chapter 3, conduct books and magazines served to guide women with respect to their domestic, subservient roles, usually prioritizing the upper class. However, novels written by women—and sometimes by men—also guided women, albeit in ways that occasionally overturned or disrupted androcentric norms and expectations for the female sex. For example, Charlotte Lennox's *The Female Quixote, or the Adventures of Arabella* (1752) tells the story of a young woman so enraptured by French romances that she believes she is the heroine of said novels. As Watson (2011:31) explains in his piece "Desire and Genre in *The Female Quixote*", Arabella "wields more power than women typically do in eighteenth-century novels" but this power is eventually stripped away as she comes to terms with her true reality and she ultimately marries her cousin.

What strays from social convention is Arabella's quixotic life as a romance novel heroine which provides her the power to control her life in ways that were previously impossible as she

sought after “fame, power and influence, [and] heroic status” (Schmid 1997:21). However, Arabella’s attempt to control her life ultimately failed, as it often did in the literature of the period (Brophy 1991:249). This is a trend that appeared even prior to Lennox’s works, as demonstrated by Aphra Behn’s play *The Feigned Courtesans* (1679), which tells the story of three women who cross-dressed as men and disguised themselves as courtesans in order to avoid pre-determined fates set by men. All three women eventually marry and succumb to the domesticity that they initially so fervently avoided (Barca 2018:6-7).

Moll Flanders and Roxana, the protagonists in Daniel Defoe’s eponymous novels, are two women who experience entrepreneurial freedom and exploration after their lives become destabilized when the men in their lives leave (Moglen 2001:36). Like the women in Defoe’s novels, poor women in 18th century London were also required to care for themselves and their families if and when men left them or died. This granted them a certain social freedom not generally part of the accepted stereotype of women’s roles. However, unlike the novels, poor women were not given the opportunity to explore the world or go on fantastical adventures that gave them financial freedom and success and, in many cases, their employment options were limited to poorly paid piece work or prostitution (Simonton 2005:102).

If literature reflects the social world, the way women are depicted in fiction may shed light on how women behaved—or were expected to behave—in real-life 18th century England. A general summary of the trend seen in fiction written by women is that female characters are powerful until rendered otherwise by patriarchal conventions present throughout society. The mechanisms of subordination were marriage, domesticity, and submission to men. When women began to be given the opportunity to explore more expanded roles in literature, this may reflect a greater desire for autonomy on the part of women in wider society; however, the inevitable

reversion to a submissive role also reflects what society *expected* of women at the time. For the women in this sample, osteoporosis and bone frailty were inevitable as they bore children and grew old; these were biosocial realities that largely could not be negotiated by women in traditional positions of little power.

Men and Fractures

Fractures exhibited statistically significant differences between the sexes in that they primarily affected males, but this variable did not exhibit significant differences between classes. The presence of fractures can be due to various causes, including violence, accidents, or underlying pathologies. In this sample, the condition crossed socioeconomic categories for males, affecting both young and old men from St. Bride's Lower, St. Benet Sherehog, and Chelsea Old Church. As discussed previously, the gin epidemic and the ubiquity of readily available distilled spirits afflicted both men and women, but men's greater inclination toward drinking could have contributed to the higher rates of fractures as alcohol decreases bone remodeling and increases the likelihood of accidents and physical altercations (Mikosch 2014:16, 20). The fact that the oldest men in the sample exhibited the most pathologies and traumas was not unexpected, as those who lived to be over 46 years old had more time to grow sick or sustain injuries. What is interesting, however, is that older men in the sample coped with their illnesses and injuries throughout life to *make it* to 46 years of age, hinting at a resiliency in both the poorest and wealthiest cemeteries. What is necessary to explore, however, is how socioeconomic differences might have influenced the presence of fractures in this sample, as leisure activities, sports, and vices were often divided along class lines.

The poor engaged in heavy drinking, especially beer and, come the mid-18th century, gin, so much so that the consumption of gin during this time was considered an epidemic (Warner et

al. 2001:375). The inclination for the working class to consume high quantities of distilled spirits was likely due to a growing interest in consumables, including tobacco and sugar (Warner et al. 2001:376). Chronic alcohol consumption can contribute to bone mass deterioration and increased fractures (Ulhøi et al. 2017:131). Wealthier men, too, could have been engaging in dangerous activities or aristocratic debauchery, specifically nearing the mid-1800s as economic and militaristic competition abroad encouraged virality and masculine ideals (Francis 2002:641).

Sports, for example, were engaged in by men across socioeconomic lines. However, the type of sport determined who was playing it compared to who was financially supporting it, as class is largely considered the "dominant analytical paradigm" when investigating sports in 18th century England (Huggins 2012:190). For example, wealthy individuals would participate in "shooting, fishing, and foxhunting" (Huggins 2012:196) while activities such as wrestling, cockfighting, and horseracing were engaged in by working class men but patronized by wealthier men (Huggins 2012:202). Boxing, was a popular sporting activity in 18th and 19th century England (Brickley and Smith 2006:171), and has been studied extensively to understand the degree to which such activity can cause physical trauma, as well as the patterns of said trauma in order to better identify osteological damage via hand-to-hand combat in the bioarchaeological record.

Trauma from boxing is often found on the skull, especially the mandible, nasal bones, and the hyoid bone, as well as the hand and wrist, specifically the fifth metacarpal and trapezium (Hershkovitz et al. 1996:168). However, trauma in other locations on the body may result from boxing, such as damage to the humerus, ulna, ribs, hand and feet phalanges, zygomatic arch, clavicle, and femoral head, with a primary focus of abundant fractures on "digits, ribs, and facial bones" (Hershkovitz et al. 1996:177). In England during this time, boxing was not known to be a

"gentlemanly activity" until the end of the 19th century when Queensbury rules were adopted, and the wearing of gloves became normalized (Brickley and Smith 2006:172). Prior to that, however, boxing was an activity primarily engaged in by working class men, with bareknuckle boxing, which was prevalent prior to 1875, causing fractures to the fourth and fifth metacarpal because the boxing style at the time focused on men punching with their fists turned upward rather than pivoting their bodies to rotate the fist when making contact (Brickley and Smith 2006:173).

Of the men in the sample, there is considerable variation in fracture locations, therefore the types of behaviors men were engaging in must remain speculative without any definitive statistical conclusions being drawn. For example, of the oldest men from St. Bride's Lower who are over 46 years old, 25 of 38 individuals exhibited signs of rib fractures, while only 2 of 12 men who were 46 years or older from Chelsea Old Church exhibited signs of rib fractures. The variation between sample sizes in the cemeteries also creates conflicts in this analysis. Furthermore, nasal and hand fractures, specifically fractures of the 4th and 5th metacarpals, are few, making it less likely that boxing was a widespread activity in the communities examined here. This does not discount the fact that men's social lives may have included boxing, but there is little osteological evidence in this sample to clearly suggest this.

When interpreting the results for men, it is important to look further into the literature from 18th century England. Men's periodicals and magazines were discussed earlier in this chapter. Publications like *The Gentleman's Magazine* reflected and modeled class and gender roles for men, primarily focusing on how wealthy men should behave to establish and reinforce masculine gentility. However, fictional literature was also used to reflect society and demonstrate what it meant to be a man, specifically a gentleman, in 18th century England.

An example of this type of literature is *Robinson Crusoe* by Daniel Defoe. Defoe, whose work also discussed women's freedom and individualism, explored male individualism in his magnum opus. In feminist circles, it has been argued that Defoe's writing calls into question the reality of autonomy and individualism for women (Moglen 2001:19). While Moll Flanders and Roxana both experience autonomy and freedom in a difficult, capitalist world, they are both returned to their socially prescribed feminine roles at the conclusion of their tales, thus repairing the paradox of a female individualist (Moglen 2001:22). However, Robinson Crusoe, in an effort to obtain autonomy and freedom, conquers nature, becomes the ruler of the island he is stranded upon, masculinizes conventionally feminine labor roles while thus stranded, and still returns to civilization "a master of military strategy, an innovative planner, and a courageous leader of his motley band of men" (Moglen 2001:31). What Defoe has done is demonstrate how women, such as Moll and Roxana, cannot be expected to maintain power and authority while men can and should be expected to harness it through any means necessary, including exploitation, xenophobia, and transgression (Moglen 2001:29-31). As reflections of Defoe's difficult life of entrepreneurial failure, bankruptcies, and debt (Moglen 2001:17-18), the author's novels explore the harsh reality of capitalism through the lens of masculinity and manhood: where difficulties may be faced, success can be found through hard work and perseverance. But for women like Moll and Roxana, where difficulties will also inevitably arise, success must eventually be set aside in deference to complacency and domesticity.

Defoe's contribution to the genre of literary realism shows the expectations and realities of men and women in 18th century London. In *Robinson Crusoe*, Defoe may be suggesting that men were expected to be physical, forward, and conquering individuals, regardless of their circumstances. This encapsulates the distribution of fractures among wealthy men in this thesis.

However, the prescriptive behavior outlined in conduct books is contradicted by the lived experiences of middle-class and wealthy men. For example, in the site report for St. Benet Sherehog, the burial register shows that many men were engaged in several types of occupations, including merchant, schoolmaster, joiner, cooper, oilman, colonel, servant, victualler, pensioner, corn factor, pocketbook maker, and jeweler (Miles et al. 2008:47-51). Furthermore, in the site report for Chelsea Old Church, several families are highlighted, with men described as working as bricklayers, bakers, coal merchants, butchers, and beadles (Cowie et al. 2008:21-26). While some of these positions, such as schoolmaster, may have been relatively low risk sedentary occupations, several of the jobs that men took up in the parish of St. Benet Sherehog and Chelsea Old Church did present risks to their health and wellbeing. Men from St. Benet Sherehog and Chelsea Old Church may not have necessarily been fully engaged in laid back, reserved lifestyles where work was not a necessity for them because they had access to paid labor; given the number of men from St. Benet Sherehog and Chelsea Old Church with fractures, hard work and physical struggle were realities for many men regardless of class status.

Summary

Based on the results presented here the standards established by authors of how-to guidebooks and magazines are not wholly reflective of the lived experiences of the men in the sample population examined in this thesis. Instead, the men in the sample from all three populations—wealthy, middle class, and poor—embody lifestyles and experiences moored in physical and pathological struggle. How those struggles were embodied does not vary as much as the struggles employed. For women who exhibited conditions that were significantly different from men, particularly regarding osteoporosis, they embodied experiences that women from all classes would have faced: pregnancy, lactation, and menopause. However, biosocial stresses

related to pregnancy and menopause were only some of the burdens faced by women, as poor women in particular would also have faced unsanitary living conditions and lack of access to nutritional foods that would have left individuals more susceptible to diseases, specifically digestive and diarrheal diseases, thus causing elevated levels of bone frailty.

When compared to gender norms in English literature of the Long Eighteenth Century, the results suggest that men and women were living in ways that largely aligned with how society expected them to behave according to their gender roles and class status. Guidebooks and magazines for women expected them to be compliant and submissive to men as they cared for children and the household. The documentary sources primarily focused on prescriptions for wealthy women but these pre- and proscriptions were applied unilaterally to all women regardless of class status. Fictional literature, on the other hand, occasionally depicted women in powerful roles; however, those roles generally devolved into women embracing domesticity and renouncing their autonomy. Guidebooks and magazines for men established how men with money and culture should behave, including having a proper education and spending one's money wisely to avoid ridicule. Again, these texts prioritized the lives of wealthy men and, in the case of *The Gentleman's Magazine*, outwardly excluded non-genteel men unless they acquired money and status from successful yet uncultured careers (Stafford 2009:74). Fictional literature that focused on men depicted them as domineering conquerors meant to subjugate and rule, and at no point were these roles minimized or stripped away from them to be replaced by a more domestic or homely role. Men and women were strictly segregated in both fiction and non-fiction; writers established and reinforced gender roles and expectations for both groups in 18th century London.

The problem of multiple comparisons impacted how the results of this analysis could be interpreted. While only two conditions examined in this thesis exhibited a statistically significant difference between the sexes, those conditions, osteoporosis and fractures, do provide insight into the lives of certain individuals from St. Bride's Lower, St. Benet Sherehog, and Chelsea Old Church. However, the remaining conditions that were unable to be analyzed due to false statistical significance posed a major problem for the main goal of this thesis, which was to determine if gender and class roles can be discerned through patterns of pathological and traumatic conditions. Solutions to this issue will be explored in Chapter 6.

Chapter 6: Recap, Future Research, and Conclusion

Embodiment of Identities and the Life Course

Sex and gender have always intersected with other identities and social roles (Hollimon 2011:149). As people go through life from birth until death, some of the identities they create and that are created for them are imposed on their bodies, moving from flesh to bone. The skeleton is a plastic, changing entity—an actor in its own right—that reflects a lifetime of experiences both personal and public. Sex identification, gender roles, sexual orientation, religion, ethnicity, occupation, nationality, disability status, age, and class are some of the many identities that shape our lives and impact us down to our biology. It is how these identities are performed, however, that determines what is seen in the body after death. How does society structure gender roles? Does society perceive sex as equal to gender, thus creating gender roles based on genitalia? What roles and occupations are men and women expected to take up, if any? How does class interfere with who can work in what profession? What are the hazards associated with professions for the wealthy and professions for the poor? Are the elderly expected to work? Are the young? What categories define "elderly" and "young"? These are some of the many questions that are necessary to ask when performing bioarchaeological research. The skeleton may be able to tell many stories quantitatively, but it is up to the researcher to interpret what those stories mean from a holistic, biocultural perspective.

The life course is a primary focus of this thesis as it uses socioeconomic and historic contexts to understand the individual experiences of people in the past (Agarwal 2016:131). It also recognizes the plasticity of the skeleton and its ever-changing nature in order to explain the ways in which environmental, socioeconomic, and sociocultural pressures shape the skeleton over time. As outlined in the results of this thesis, the bodies of the individuals studied were not

mere representations of their pathologies and traumas; instead, they were collective representations of economic, social, cultural, political, and environmental systems that dictated who worked certain jobs, engaged in certain activities, ate certain foods, and lived in certain places. Poor women afflicted with osteoporosis were not simply experiencing a consequence of biosocial expectations such as pregnancy, lactation, and menopause, but socioeconomic burdens such as unsanitary living conditions and disadvantaged childhoods that likely exposed them to digestive diseases and lack of proper sustenance, *as well* as childbearing, breastfeeding, and menopause. Men, too, were not merely physical actors engaged in socially proscribed roles; they were victims of a system that required that they work long, strenuous hours in high risk occupations in factories, on the docks, and on farms. For poor men, the socioeconomic systems in place saw them as less valued, resulting in them residing and working in a highly hazardous urban London. More well-to-do men did not necessarily enjoy a lifestyle entirely protected from risk. The presence of fractures among men from Chelsea Old Church and St. Benet Sherehog suggest that some men who were not technically poor were also working physically demanding jobs and engaging in high risk social activities and were not solely educating themselves or challenging one another to debates in the pages of men's magazines. The harsh realities of 18th century London would have been familiar to all of the demographic groups in the sample, but the ways in which men and women were expected to live were written not just in the bioarchaeological data, but in the literary evidence from the time as well.

Literature and Bioarchaeological Context

By using texts written during the time of the study as a starting point for identifying social expectations and norms regarding gender and status, this thesis sought to overcome the presentist boundaries that bioarchaeological research often faces (Hollimon 2011:150). While the

literature could not explain every aspect of the pathologies and traumas the members of the sample experienced, it did serve to clarify how men and women were being written about, which in turn informed how society perceived the behaviors and expectations that men and women were under constant pressure to conform to. The supplemental literary evidence consulted in this thesis helped to provide a larger context for the bioarchaeological data. Social bioarchaeology stresses the importance of context when understanding lived experiences (Larsen 2017:873), and both fiction and non-fiction sources contributed to this context of the sample population. Authors such as Daniel Defoe, Charlotte Lennox, Richard Allestree, and Aphra Behn all discussed what it meant to be men and women during the Long Eighteenth Century in England. In particular, these publications focused on how gender was perceived in English society, often from a viewpoint that disrupted or challenged stereotypical gender roles to some extent. As has been discussed, however, these tales almost always resulted in their characters—especially women—emerging from their fantastical experiences to return to more domesticated and socially approved lives.

Periodicals and magazines like *The Ladies Calling* and *The Gentleman's Magazine* took different stances: men and women were not given the leeway to express themselves in non-conventional ways; instead, these publications served to guide them on how to be the best men and women they could be within rigidly defined limits. Unlike novels and plays, periodicals and magazines more realistically represented what was expected of men and women, while fiction gave characters freedom to explore other realities. At the end of the day, however, all of the literature referenced in this thesis echoed the same expectations of gender roles: men were to be dominant, conquering forces while women were to be submissive and domestic. The content of the publications discussed throughout reflect both broad and niche views of men and women but ultimately conclude with stereotypical expectations of gender roles. By using written texts from

the Long Eighteenth Century, this thesis supplemented the bioarchaeological and statistical data with emic perspectives on gender roles and expectations in London during this time.

Future Research

First, the issue of the multiple comparisons problem must be addressed. Because of the number of conditions that were examined in this thesis, the large number of comparisons yielded results that suggested statistical significance but were not actually statistically significant. However, two conditions did yield genuine statistically significant differences between the sexes, osteoporosis and fractures. With this in mind, this research provides a jumping off point for future research to examine how fractures and osteoporosis affected the individuals in this sample and contemporary cemeteries in London in a way that can put a spotlight on these conditions, without the need for additional trial and error analyses. For example, by expanding the number of cemeteries analyzed, future research can explore the differences between the sexes in regard to the presence and absence of fractures, highlighting the types of fractures and where they occurred, potentially creating a clearer picture of how the fractures of individuals from wealthier cemeteries may have varied or aligned with individuals from poorer cemeteries. This could pave the way for understanding how traumatic experiences were similar and/or different between men from varying socioeconomic classes, thus providing a means of exploring how men's gendered and class experiences were embodied through their trauma.

Furthermore, this research serves as a cautionary tale for other students who may be interested in exploring pathological and traumatic conditions in a skeletal sample—while more conditions available to examine may seem appealing, focusing on a small handful of conditions not only avoids the multiple comparisons problem, but will provide the author with an opportunity to focus more closely on the few conditions examined.

While the specific goals of this thesis were not wholly achieved, the approach used can be modified and applied to other historic populations with existing and reliable written texts, providing researchers with the opportunity to compare literary evidence from the time with pathological and osteological data to understand how emic written perspectives were reflected in the lived experiences of a population. However, the goals of this thesis can also be applied to living populations; it is this idea that will be explored here.

Modern America is saturated with social media websites and apps across all technological mediums. Behaviors and beliefs are projected for millions of people to see, and as knowledge is disseminated and spreads, influence comes with it. The term "influencers" is literally used to describe individuals on social media with considerable authority who have an impact on the social conscience. Rather than relying solely on books and magazines for information about what others are doing, swiping through one's Twitter, Facebook, or Instagram feeds grants millions of people access to the lived experiences of those around them. It is this new form of digital media that creates a breeding ground for research and experimentation.

Apps created to alter one's appearance in photos, such as Facetune, or filters found on apps such as Instagram and Snapchat, give users the opportunity to literally reshape their appearance. In an article by *The Guardian,* filters are used to slightly alter facial features, such as giving a user bigger eyes, a smaller nose, and clearer skin and, as a result, patients can easily go to plastic surgeons with images of these idealized versions of themselves to achieve these fantasies in real life (Hunt 2019:2). How people display themselves on social media is a constant battle between the newest trends, and these trends can lead to real world consequences.

The content of the 18th century magazines discussed throughout this thesis reflected how people presented themselves then just as social media does today. Debates and discourse,

representations of wealth and status, and depictions of what it means to be a successful man or woman are present on the screens of people's phones just as they were on the pages of periodicals. By making use of this same concept, future research can explore the health and wellness of people in contemporary America to see if and how trends in depictions of gender and class on social media are being reflected in living populations as people engage in labor, occupy jobs, and inhabit social roles that both stray from and conform to expectations of what it means to be an American man or woman. Where future research potentially becomes particularly fascinating, however, is by exploring those not inside this binary: how can we understand the health and disease statuses of gender non-conforming people, and do any standards exist which can be used to compare sociocultural expectations of such groups?

Queer theory, which was largely absent in the content of this thesis, could be used in future research to understand how queer identities were formed, took shape, and reaffirmed themselves in a world clinging to a gender binary. It can also be used to understand how health and wellness are experienced in queer communities, and how fluid, or even non-existent gender roles impact queer American society. Here it would be necessary to explore class and race in a highly critical manner, however, as the health differences between queer people of color and queer white people have been documented (Eckhert 2016: 243; Sutter and Perrin 2016:201; see also Bith-Melander et al. 2010). Additionally, it is necessary in this type of research to avoid medicalizing and thus pathologizing queer bodies, as past and present research often treats heterosexuality and the heteronormative gender binary as the standard context within which individuals function, and treat queerness as the dysfunctional and deviant mechanism (Eckhert 2016:242). Alternatively, the application of queer theory to the concept of this thesis on past societies would be an interesting way to examine whether it is possible to identify gender non-

conforming peoples based on disease and trauma patterns, specifically in relation to expected gender roles and gendered behavior. There are two specific cultural contexts in Victorian England where this could be tested as well: brothels and the theater. The contrast between these normative and the non-conforming parallel worlds is represented in another form of modern storytelling: film. A particularly good example is the biopic "Topsy-Turvy", which tells the story of the musical theater duo Gilbert and Sullivan and beautifully exposes these contrasting but coeval facets of Victorian London society.

Lastly, future research could also examine trends in Anglo-American culture throughout history by focusing on the victims of socioeconomic and cultural trauma. As this thesis demonstrated, men were disproportionately impacted by physical traumas that, for some, could have made their bodies unusable after a point. Men, who were expected to engage in harsh physical activity, paid the price of these social expectations and norms. Men in contemporary America, too, exhibit higher rates of occupational fatalities than women (Bauerle et al. 2016:102). Exploring how class and gender dictate who must, or is expected to, engage in certain occupational roles, can reveal how blue-collar and working class men are not only serving in their roles, but are victims of greater systemic structures that force the poor and working class to engage in highly hazardous behavior that disproportionately affects men.

Conclusion

The results of this thesis suggest that women and men in 18th century London were living largely in accordance with their gender roles. The poor population buried in St. Bride's Lower cemetery was disproportionately affected by trauma and disease compared to the wealthier populations of St. Benet Sherehog and Chelsea Old Church, but members of Chelsea Old Church—the wealthiest cemetery in the sample—showed a far higher incidence of disease and

trauma than St. Benet Sherehog, the middle-class cemetery. The oldest members of the sample exhibited more conditions per individual than the younger members of the population, suggesting that those who lived over 46 years of age were resilient enough to have contracted five or more conditions per individual and survive, reaffirming the osteological paradox.

Men were more disproportionately affected than women in the sample. Where sex differences between males and females were statistically significant, males exhibited higher rates of fractures compared to women. More women, on the other hand, exhibited osteoporosis than men. The differences between the sexes suggest that men and women generally aligned with their expected gender roles: men were engaged in physically harsh lifestyles that caused severe traumatic harm to their bodies, while women were undergoing biosocial pressures such as pregnancy, lactation, and menopause.

The results of this thesis are not a testament to how all Londoners lived in 18th century London. Rather, they represent three sub-samples of the London population and reflect how members of St. Bride's Lower, St. Benet Sherehog, and Chelsea Old Church lived and behaved. This thesis also demonstrates how literature written at the time of the study sample can be used to help interpret patterns of disease and trauma in a bioarchaeological population, as well as how gendered patterns of behaviors can be examined through the medium of the skeleton. The goal of this thesis was to understand how the relationship between gender and class showed itself on the human skeleton, and how bioarchaeology and gender studies could be used to interpret health and disease in past populations.

References Cited

Agarwal, Sabrina C.
2012 The Past of Sex, Gender, and Health: Bioarchaeology of the Aging Skeleton. *American Anthropologist* 114(2):322-335.

2016 Bone Morphologies and Histories: Life Course Approaches in Bioarchaeology. *Yearbook of Physical Anthropology* 159:130-149.

2017 Understanding Sex- and Gender-Related Patterns of Bone Loss and Health in the Past: A Case Study from the Neolithic Community of Çatalhöyük. In *Exploring Sex and Gender in Bioarchaeology,* edited by Sabrina C. Agarwal and Julie K. Wesp, pp. 165-188. New Mexico Press, Albuquerque.

2019 Understanding Bone Aging, Loss, and Osteoporosis in the Past. In *Biological Anthropology of the Human Skeleton,* edited by M. Anne Katzenberg and Anne L. Grauer, pp. 385-414. John Wiley & Sons, Hoboken.

Agarwal, Sabrina C. and Julie K. Wesp (editors)
2017 *Exploring Sex and Gender in Bioarchaeology.* New Mexico Press, Albuquerque.

Alberti, Benjamin
2013 Queer Prehistory: Bodies, Performativity, and Matter. In *A Companion to Gender Prehistory,* edited by Diane Bolger, pp. 86-207. John Wiley & Sons, Hoboken.

Alberti, Gianmarco
2013 An R Script to Facilitate Correspondence Analysis. A Guide to the Use and the Interpretation of Results from an Archaeological Perspective. *Archeologia e Calcolatori* 24:25-53.

Allen, Terry, Shannon A. Novak, and Lawrence L. Bench
2007 Patterns of Injuries: Accident or Abuse. *Violence Against Women* 13(8):802-816.

Allestree, Richard
1673 *The Ladies' Calling.* The Theater, Oxford.

Andrews, Jonathan and Clark Lawlor
2017 Introduction "An Exclusive Privilege…to Complain": Framing Fashionable Diseases in the Long Eighteenth Century. *Literature and Medicine* 35(2):239-269.

Armelagos, George J. and Dennis P. Van Gerven
2003 A Century of Skeletal Biology and Paleopathology: Contrasts, Contradictions, and Conflicts. *American Anthropologist* 105(1):53-64.

Arnold, Bettina and Robert J. Jeske
2014 The Archaeology of Death: Mortuary Archaeology in the US and Europe 1990-2013. *Annual Review of Anthropology* 43:325-346.

Austen, Jane
1967 [1813] *Pride and Prejudice*, edited by G.C. Rosser. University of London Press Ltd, London.

Bannet, Eve Tavor
2013 History of Reading: The Long Eighteenth Century. *Literature Compass* 10(2):22-133.

Barca, Maria
2018 Aphra Behn's Courtesans and Crossdressing Women: An Analysis of Gender and Power in 17th Century Literature. *Locus: The Seton Hall Journal of Undergraduate Research* 1(2):1-8.

Baudino, Isabelle (editor)
2005 Eighteenth-Century Images of Working Women. In *The Invisible Woman: Aspects of Women's Work in Eighteenth-Century Britain*, edited by Isabelle Baudino, Jacques Carré, and Cécile Révauger pp. 173-182. Routledge, Oxfordshire.

Bauerle, Timothy J., Alyssa K. McGonagle, and Vicki J. Magley
2016 Mere Overrepresentation? Using Cross-Occupational Injury and Job Analysis Data to Explain Men's Risk for Workplace Fatalities. *Safety Science* 83:102-113.

Binford, Lewis R.
1971 Mortuary Practices: Their Study and Their Potential. *Memoirs of the Society for American Archaeology* 25:6-29.

Bith-Melander, Pollie, Bhupendra Sheoran, Lina Sheth, Carlos Bermudez, Jennifer Drone, Woo Wood, and Kurt Schroeder
2010 Understanding Sociocultural and Psychological Factors Affecting Transgender People of Color in San Francisco. *Journal of the Association of Nurses in AIDS Care* 21(3):207-220.

Blackmore, Chelsea
2011 How to Queer the Past Without Sex: Queer Theory, Feminisms and the Archaeology of Identity. Archaeologies: Journal of the World Archaeological Congress 7(1):75-96.

Brickley, Megan and Martin Smith
2006 Culturally Determined Patterns of Violence: Biological Anthropological Investigations at a Historic Urban Cemetery. *American Anthropologist* 108(1):163-177.

Brophy, Elizabeth Bergen
1991 *Women's Lives and the 18th Century English Novel.* University of South Florida Press, Tampa.

Buikstra, Jane and Douglas H. Ubelaker
1994 *Standards for Data Collection from Human Skeletal Remains*. Arkansas Archaeological Survey, Fayetteville.

Buikstra, Jane, Della C. Cook, and Katelyn L. Bolhofner
2017 Introduction: Scientific Rigor in Paleopathology. *International Journal of Paleopathology* 19:80-87.

Butler, Judith
1990 *Gender Trouble: Feminism and the Subversion of Identity*. Routledge, Chapman & Hall, Inc., New York City.

Buzon, Michele R.
2012 The Bioarchaeological Approach to Paleopathology. In *A Companion to Paleopathology,* edited by Anne L. Grauer, pp. 58-75. Blackwell Publishing Ltd., Hoboken.

Byers, Steven N. (editor)
2017 *Introduction to Forensic Anthropology*. 5th ed. Routledge, London.

Clouse, Robert Alan
1999 Interpreting Archaeological Data Through Correspondence Analysis. *Historical Archaeology* 33(2):90-107.

Conkey, Margaret W. and Janet D. Spector
1984 Archaeology and the Study of Gender. *Advances in Archaeological Method and Theory* 7:1-38.

Connell, Brian and Peter Rauxloh
n.d. *A Rapid Method for Recording Human Skeletal Data.* Museum of London. https://www.museumoflondon.org.uk/application/files/6514/7308/7527/RapidMethodRecordingManual.pdf

Cowie, Robert, Jelena Bekvalac, and Tania Kausmally
2008 *Late 17th- to 19th-Century Burial and Earlier Occupation at All Saints, Chelsea Old Church, Royal Borough of Kensington and Chelsea.* Museum of London Archaeology Service, London.

Cully, Amy
2015 Women's Life Writing in the Long 18th Century: A Critical Survey. *Literature Compass* 12(1):1-11.

Curate, Francisco
2014 Osteoporosis and Paleopathology: A Review. *Journal of Anthropological Sciences* 92:119-146.

Defoe, Daniel
1959 [1722] *Moll Flanders*, edited by James Sutherland. Houghton Miflin, Boston.

1981 [1719] *The Life and Strange Surprizing Adventures of Robinson Crusoe of York, Mariner*, edited by J. Donald Crowley. Oxford University Press, New York.

1982 [1724] *Roxana: The Fortunate Mistress*, edited by David Blewett. Penguin, New York.

2005 [1709] The Review. In *London Life in the 18th Century*, by M.D. George, pp. 363. Chicago Review Press, Chicago.

DeWitte, Sharon N., Gail Hughes-Morey, Jelena Bekvalac, and Jordan Karsten
2015 Wealth, Health and Frailty of Industrial-Era London. *Annals of Human Biology* 43(3):241-254.

Eckhert, Eric
2016 A Case for the Demedicalization of Queer Bodies. *Yale Journal of Biology and Medicine* 89:239-246.

Englestad, Ericka
2007 Much More than Gender. *Journal of Archaeological Method and Theory* 14:217-234.

Francis, Martin
2002 The Domestication of the Male? Recent Research on Nineteenth- and Twentieth-Century British Masculinity. *The Historical Journal* 45(3):637-652.

Fausto-Sterling, Anne
2005 The Bare Bones of Sex: Part 1 Sex and Gender. *Signs: Journal of Women in Culture and Society* 30(2):1491-1527.

Gabbard, Dwight Christopher
2011 Disability Studies and the British Long Eighteenth Century. *Literature Compass* 8(2):80-94.

Geller, Pamela L.
2017 Brave Old World: Ancient DNA Testing and Sex Determination. In *Exploring Sex and Gender in Bioarchaeology*, edited by Sabrina C. Agarwal and Julie K. Wesp, pp. 71-98. New Mexico Press, Albuquerque.

Ghisleni, Lara, Alexis M. Jordan, and Emily Fioccoprile
2016 Introduction to "Binary Binds": Deconstructing Sex and Gender Dichotomies in Archaeological Practice. *Journal of Archaeological Method and Theory* 23:765-787.

Goodman, Alan H.
1993 On the Interpretation of Health from Skeletal Remains. *Current Anthropology* 34(3):281-288.

Gordon, Eleanor and Gwyneth Nair
2006 Domestic Fathers and the Victorian Parental Role. *Women's History Review* 15(4):551-559.

Gowland, Rebecca L.
2015 Entangled Lives: Implications of the Developmental Origins of Health and Disease Hypothesis for Bioarchaeology and the Life Course. *American Journal of Physical Anthropology* 158:530-540.

Grauer, Anne L.
2017 A Century of Paleopathology. *American Journal of Physical Anthropology* 165:904-914.

2019 Paleopathology: From Bones to Social Behavior. In *Biological Anthropology of the Human Skeleton*, edited by M. Anne Katzenberg and Anne L. Grauer, pp. 447-465. John Wiley & Sons, Inc., Hoboken.

Gray, J. Patrick
1998 Regional Patterning in Illness Theories: Analyses with Different Types of Optimal Scaling. *Cross-Cultural Research* 32(1):3-36.

Hays-Gilpin, Kelley
2000 Feminist Scholarship in Archaeology. *The Annals of the American Academy of Political and Social Science* 571:89-103.

2007 Gender. In *Handbook of Archaeological Theories*, edited by R. Alexander Bentley, Herbert D.G. Maschner, and Christopher Chippindale, pp. 429-447. AltaMira Press, Lanham.

Hershkovitz, I., L. Bedford, L.M. Jellema, and B. Latimer
1996 Injuries to the Skeleton Due to Prolonged Activity in Hand-to-Hand Combat. *International Journal of Osteoarchaeology* 6:167-178.

Hershkovitz, Israel, Charles Greenland, Bruce M. Rothschild, Bruce Latimer, Olivier Dutour, Lyman M. Jellema, and Susanne Wish-Baratiz
1999 Hyperostosis Frontalis Interna: An Anthropological Perspective. *American Journal of Physical Anthropology* 109:303-325.

Hill, Erica
1998 Gender-Informed Archaeology: The Priority of Definition, the Use of Analogy, and the Multivariate Approach. *Journal of Archaeological Method and Theory* 5(1):99-121.

Hogarth, William
1738 *Four Times of the Day: Morning*. Wikimedia Commons. Web. 5 March 2020.

1741 *The Enraged Musician.* Wikimedia Commons. Web. 5 March 2020.

1751 *Gin Lane*. Wikimedia Commons. Web. 6 March 2020.

Hollimon, Sandra E.
2011 Sex and Gender in Bioarchaeological Research: Theory, Method, and Interpretation. In *Social Bioarchaeology*, edited by Sabrina C. Agarwal and Bonnie A. Glencross, pp. 149-182. Blackwell Publishing Ltd., Hoboken.

Huggins, Mike
2012 Popular Culture and Sporting Life in the Rural Margins of Late Eighteenth-Century England: The World of Robert Anderson, "The Cumberland Bard". *Eighteenth-Century Studies* 45(2):189-205.

Hunt, Elle
2019 Faking It: How Selfie Dysmorphia is Driving People to Seek Surgery. In *The Guardian* 23 January 2019:1-7. https://www.theguardian.com/lifeandstyle/2019/jan/23/faking-it-how-selfie-dysmorphia-is-driving-people-to-seek-surgery

Joyce, Rosemary A.
2005 Archaeology of the Body. *Annual Review of Anthropology* 34:139-158.

2017 Sex, Gender, and Anthropology: Moving Bioarchaeology Outside the Subdiscipline. In *Exploring Sex and Gender in Bioarchaeology*, edited by Sabrina C. Agarwal and Julie K. Wesp, pp. 1-12. New Mexico Press, Albuquerque.

Judd, Margaret A. and Charlotte A. Roberts
1999 Fracture Trauma in a Medieval British Farming Village. *American Journal of Physical Anthropology* 109:229-243.

Klaus, Haagen D.
2014 Frontiers in the Bioarchaeology of Stress and Disease: Cross-Disciplinary Perspectives from Pathophysiology, Human Biology, and Epidemiology. *American Journal of Physical Anthropology* 155:294-308.

Knudson, Kelly J. and Christopher M. Stojanowski
2008 New Directions in Bioarchaeology: Recent Contributions to the Study of Human Social Identities. *Journal of Archaeological Research* 16:397-432.

Langbauer, Laurie
1990 *Women and Romance: The Consolations of Gender in the English Novel.* Cornell University Press, Ithaca.

Larsen, Clark Spencer
2015 *Bioarchaeology: Interpreting Behavior from the Human Skeleton,* edited by Clark Spencer Larsen. University Printing House, Cambridge.

2017 Bioarchaeology in Perspective: From Classifications of the Dead to Conditions of the Living. *American Journal of Physical Anthropology* 165:865-878.

Lawlor, Clark
2017 "The History of Half the Sex": Fashionable Disease, Capitalism, and Gender in the Long Eighteenth Century. *Literature and Medicine* 35(2): 355-386.

Lee, Bee-Leng
1996 Correspondence Analysis. *LL Thurstone Psychometric Laboratory Research Memorandum.* 64-78.

Lehmann, Gilly
2005 The Birth of a New Profession: The Housekeeper and her Status in the Seventeenth and Eighteenth Centuries. In *The Invisible Woman: Aspects of Women's Work in Eighteenth-Century Britain*, edited by Isabelle Baudino, Jacques Carré, and Cécile Révauger, pp. 9-25. Routledge, Oxfordshire.

Lennox, Charlotte
1970 [1752] *The Female Quixote; or, The Adventures of Arabella.* Oxford University Press, New York.

Lovell, Nancy C. and Anne L. Grauer
2019 Chapter 10: Analysis and Interpretation of Trauma in Skeletal Remains. In *Biological Anthropology of the Human Skeleton*, edited by M. Anne Katzenberg and Anne L. Grauer, pp. 335-383. John Wiley & Sons, Inc., Hoboken.

Mant, Madeleine and Charlotte Roberts
2015 Diet and Dental Caries in Post-Medieval London. *International Journal of Historical Archaeology* 19:188-207.

Martin, Debra L. and Ryan P. Harrod
2016 The Bioarchaeology of Pain and Suffering: Human Adaptation and Survival during Troubled Times. *Archaeological Papers of the American Anthropological Association* 27:161-174.

Mason, Tom and Philip Smallwood
2000 Introducing the Long Eighteenth Century: Literary History and the New Pedagogy. *The Cambridge Quarterly* 29(3):191-213.

Marx, John
2015 Chapter 27: The Public Sphere. In *A Companion to the English Novel*, edited by Stephen Arata, Madigan Haley, L. Paul Hunter, and Jennifer Wicke, pp. 426-440. John Wiley & Sons, Inc., Hoboken.

Mays, Simon
2000 Age-Dependent Cortical Bone Loss in Women from 18th and Early 19th Century London. *American Journal of Physical Anthropology* 112:349-361.

2001 Effects of Age and Occupation on Cortical Bone in a Group of 18th-19th Century British Men. *American Journal of Physical Anthropology* 116:34-44.

Mehler, Natascha
2012 Written Sources in Post-Medieval Archaeology and the Art of Asking the Right Questions. *Studies in Post-Medieval Archaeology* 4:11-24.

Mikosch, Peter
2014 Alcohol and Bone. *Wiener Medizinische Wochenschrift* 164:15-24. doi:10.1007/s10354-013-0258-5

Miles, Adrian, William White, and Danae Tankard
2008 *Burial at the Site of the Parish Church of the St. Benet Sherehog Before and After the Great Fire: Excavations at 1 Poultry, City of London.* Museum of London Archaeology Service, London.

Miles, Adrian
2010 *A Post-Medieval Population from London: Excavations in the St. Bride's Lower Churchyard 75-82 Farrington Street, City of London, EC4*. Unpublished Museum of London Report, London.

Miller, Peter John
1971 Eighteenth-Century Periodicals for Women. *History of Education Quarterly* 11(3):279-286.

Moglen, Helene
2001 *The Trauma of Gender: A Feminist Theory of the English Novel.* University of California Press, Berkeley.

Morris, Rosalind C.
1995 All Made Up: Performance Theory and the New Anthropology of Sex and Gender. *Annual Review of Anthropology* 24:567-592.

Nelson, Claudia
1989 Sex and the Single Boy: Ideals of Manliness and Sexuality in Victorian Literature for Boys. *Victorian Studies* 32(4):525-550.

Newman, Sophie L. and Rebecca L. Gowland
2017 Dedicated Followers of Fashion? Bioarchaeological Perspectives on Socio-Economic Status, Inequality, and Health in Urban Children from the Industrial Revolution (18th-19th C), England. *International Journal of Osteoarchaeology* 27:217-229.

Novak, Shannon A.
2017 On the Stories of Men and the Substance of Women: Interrogating Gender through Violence. In *Exploring Sex and Gender in Bioarchaeology*, edited by Sabrina C. Agarwal and Julie K. Wesp, pp. 129-164. New Mexico Press, Albuquerque.

Ortner, Donald J.
2011 Human Skeletal Paleopathology. *International Journal of Paleopathology* 1:4-11.

Ortner, Donald J. and Walter G.J. Putschar (editors)
1985 *Identification of Pathological Conditions in Human Skeletal Remains.* Smithsonian Institution Press, Washington D.C.

Phillips, Susan P.
2005 Defining and Measuring Gender: A Social Determinant of Health Whose Time has Come. *International Journal for Equity in Health.* 4(11):1-4.

Pinhasi, Ron and Alan Robert Ogden
2009 Morbidity, Rickets, and Long-Bone Growth in Post-Medieval Britain—A Cross-Population Analysis. *Annals of Human Biology* 33(3):372-389.

Poovey, Mary
1988 *Uneven Developments: The Ideological Work of Gender in Mid-Victorian England.* The University of Chicago Press, Chicago.

Powers, Natasha (editor)
2012 *Human Osteology Method Statement.* Museum of London, London. https://www.museumoflondon.org.uk/application/files/4814/5633/5269/osteology-method-statement-revised-2012.pdf

Redfern, Rebecca C.
2017 Identifying and Interpreting Domestic Violence in Archaeological Human Remains: A Critical Review of the Evidence. *International Journal of Osteoarchaeology* 27:13-34.

Reitsema, Laurie J. and Britney Kyle McIlvaine
2014 Reconciling "Stress" and "Health" in Physical Anthropology: What Can Bioarchaeologists Learn from the Other Subdisciplines? *American Journal of Physical Anthropology* 155:181-185.

Renshaw, Layla and Natasha Powers
2016 The Archaeology of Post-Medieval Death and Burial. *Post-Medieval Archaeology* 50(1):159-177.

Richardson, Samuel
1962 [1748] *Clarissa, or, the History of a Young Lady.* Dent, London.

Richetti, John
1998 Introduction: Fiction and Society in Eighteenth-Century Britain. In *The English Novel in History 1700-1780,* pp. 1-18. Routledge, London.

2015 Chapter 6: Realism and the Eighteenth-Century Novel. In *A Companion to the English Novel*, edited by Stephen Arata, Madigan Haley, J. Paul Hunter, and Jennifer Wicke, pp. 89-102. John Wiley & Sons, Ltd., Hoboken.

Roksandic, Mirjana and Stephanie D. Armstrong
2011 Using the Life History Model to Set the Stage(s) of Growth and Senescence in Bioarchaeology and Paleodemography. *American Journal of Physical Anthropology* 145:337-347.

Rouyer-Daney, Marie-Claire
2005 The Representation of Housework in Eighteenth-Century Women's Press. In *The Invisible Woman: Aspects of Women's Work in Eighteenth-Century Britain*, edited by Isabelle Baudino and Jacques Carré, pp. 27-36. Routledge, Oxfordshire.

Rubio, Sandra
2011 Gender Thinking in the Making: Feminist Epistemology and Gender Archaeology. *Norwegian Archaeological Review* 44:21-35.

Rudé, George
1971 *Hanoverian England 1714-1808*. University of California Press, Berkeley.

Salmon, Marylynn
1994 The Cultural Significance of Breastfeeding and Infant Care in Early Modern England and America. *Journal of Social History* 28(2):247-269.

Schmid, Thomas H.
1997 My Authority: Hyper-Mimesis and the Discourse of Hysteria in The Female Quixote. *Rocky Mountain Review of Language and Literature* 51(1):21-35.

Seifert, Donna J. (editor)
1991 Introduction. In *Gender in Historical Archaeology*, edited by Donna J. Seifert, pp. 1-5. The Society for Historical Archaeology, Germantown.

Shoemaker, Robert B.
1998 *Gender in English Society, 1650-1850: The Emergence of Separate Spheres?* Longman, London.

Shortland, David B., Martin Hussey, and Ashoka Dey Chowdhury
2008 Understanding Neonatal Jaundice: UK Practice and International Profile. *The Journal of the Royal Society for the Promotion of Health* 128(4):202-206.

Siek, Thomas
2013 The Osteological Paradox and Issues of Interpretation in Paleopathology. *Explorations in Anthropology* 13(1):92-101.

Simonton, Deborah
2005 Claiming their Place in the Corporate Community: Women's Identity in Eighteenth-Century Towns. In *The Invisible Woman: Aspects of Women's Work in Eighteenth-Century Britain*, edited by Isabelle Baudino, Jacques Carré, and Cécile Révauger, pp. 101-116. Routledge, Oxfordshire.

Skogstrand, Lisbeth
2010 Is Androcentric Archaeology Really about Men? *Archaeologies: Journal of the World Archaeological Congress* 7(1):56-74.

Snoddy, Anne Marie E., Hallie R. Buckley, and Siân E. Halcrow
2016 More than Metabolic: Considering the Broader Paleoepidemiological Impact of Vitamin D Deficiency in Bioarchaeology. *American Journal of Physical Anthropology* 160:183-196.

Sofaer, Joanna
2006 The Body as an Archaeological Resource. In *The Body as Material Culture: A Theoretical Osteoarchaeology*, pp. 12-30. Cambridge University Press, Cambridge.

2013 Bioarchaeological Approaches to the Gendered Body. In *A Companion to Gender Prehistory,* edited by Diane Bolger, pp. 226-243. John Wiley & Sons, Hoboken.

Sørensen, Marie Louise Stig
2013 The History of Gender Archaeology in Northern Europe. *A Companion to Gender Prehistory*, edited by Diane Bolger, pp. 398-412. John Wiley & Sons, Hoboken.

Spector, Janet
1983 Male/Female Task Differentiation among the Hidatsa. In *The Hidden Half: Studies of Plains Indian Women*, edited by Beatrice Medicine and Patricia Albers, pp. 77-99. University Press of America, New York.

1991 What This Awl Means: Toward a Feminist Archaeology. In *Engendering Archaeology: Women and Prehistory*, edited by Joan M. Gero and Margaret W. Conkey, pp. 388-406. Wiley-Blackwell, Oxford.

Stafford, William
2009 Representations of the Social Order in The Gentleman's Magazine, 1785-1815. *Eighteenth-Century Life* 33(2):64-91.

Sutter, Megan and Paul B. Perrin
2016 Discrimination, Mental Health, and Suicidal Ideation among LGBTQ People of Color. *Journal of Counseling Psychology* 63(1):98-105.

Tainter, Joseph A.
1978 Mortuary Practices and the Study of Prehistoric Social Systems. *Advances in Archaeological Method and Theory* 1:105-141.

Tosh, John
1996 Authority and Nurture in Middle-Class Fatherhood: The Case of Early and Mid-Victorian England. *Gender & History* 8(1):48-74.

Ulhøi, Maiken Parm, Karoline Meldgaard, Torben Steiniche, Anders Odgaard, and Annie Vesterby
2017 Chronic Alcohol Abuse Leads to Low Bone Mass with No General Loss to Bone Structure or Bone Mechanical Strength. *Journal of Forensic Sciences* 62(1):131-136. doi:10.1111/1556-4029.13256

Vermeer, Andrea C.
2009 Men, Women and Children: Gender and the Structuring of Historical Archaeology. In *International Handbook of Historical Archaeology*, edited by Teresita Majewski and David Gaimster, pp. 319-331. Springer, New York.

Walker, Don and Michael Henderson
2010 Smoking and Health in London's East End in the First Half of the 19th century. *Post-Medieval Archaeology* 44(1):209-222.

Warner, Jessica, Minghao Her, Gerhard Gmel, and Jürgen Rehm
2001 Public Health Then and Now: Can Legislation Prevent Debauchery? Mother Gin and Public Health in 18th-Century England. *American Journal of Public Health* 91(3):375-384.

Watson, Zak
2011 Desire and Genre in The Female Quixote. *Novel: A Forum on Fiction* 44(1):31-46.

White, Tim D., Michael T. Black, and Pieter A. Folkens
2012 *Human Osteology.* 3rd ed. Elsevier Academic Press, Amsterdam.

Weiss, Elizabeth (editor)
2009 Trauma: Accidents, Violence, and Surgery. In *Bioarchaeological Science: What We Have Learned from Human Skeletal Remains*, edited by Elizabeth Weiss, pp. 67-77. Nova Science Publishers, Inc., Hauppauge.

2014 Adult Bone Health. In *Paleopathology in Perspective: Bone Health and Disease through Time*, edited by Elizabeth Weiss, pp. 42-58. Rowman & Littlefield Publishers, Lanham.

Wellcome Osteological Research Database (WORD)
2018 Museum of London, online. https://www.museumoflondon.org.uk/collections/other-collection-databases-and-libraries/centre-human-bioarchaeology/osteological-database

Williams, Samantha
2011 The Experience of Pregnancy and Childbirth for Unmarried Mothers in London, 1760-1866. *Women's History Review* 20(1):67-86.

Wood, James W., George R. Milner, Henry C. Harpending, and Kenneth M. Weiss
1992 The Osteological Paradox: Problems of Inferring Prehistoric Health from Skeletal Samples. *Current Anthropology* 33(4):343-370.

World Health Organization
2019 Global Health Observatory (GHO) Data, online. https://apps.who.int/gho/data/node.main

Zuckerman, Molly K. and George J. Armelagos
2011 The Origins of Biocultural Dimensions in Bioarchaeology. In *Social Bioarchaeology*, edited by Sabrina C. Agarwal and Bonnie A. Glencross, pp. 15-31. Blackwell Publishing Ltd., Oxford.

Zuckerman, Molly K. and John Crandall
2019 Reconsidering Sex and Gender in Relation to Health and Disease in Bioarchaeology. *Journal of Anthropological Archaeology* 54:161-171.

Zuckerman, M.K., K.N. Harper, and G.J. Armelagos
2016 Adapt or Die: Three Case Studies in Which the Failure to Adopt Advances from Other Fields has Compromised Paleopathology. *International Journal of Osteoarchaeology* 26:375-383.

Appendix A:
Distribution of Conditions

	Cemetery	Chelsea Old Church		St. Benet Sherehog		St. Bride's Lower		Disease Totals
Disease		Male	Female	Male	Female	Male	Female	
Ankylosis		15	3	4	3	9	0	34
Congenital limb abnormality		14	7	8	5	31	12	77
Congenital skull malformation		1	1	0	0	9	9	20
Congenital spinal disorder		2	2	6	1	1	1	14
Cribra orbitalia		7	11	8	6	10	12	54
Dental pathology		2	0	13	4	13	3	35
Diffuse idiopathic skeletal hyperostosis (DISH)		10	1	3	0	8	0	22
Erosive arthropathy		2	0	0	0	5	4	11
Fracture (healed)		15	6	7	1	78	22	129
Gout		2	1	1	1	3	2	10
Hyperostosis frontalis interna		1	4	2	4	4	4	19
Joint disease (misc.)		11	10	9	5	0	0	35
Kyphosis		3	1	0	0	7	2	13
Metabolic disorder (general)		2	0	0	1	1	8	12
Osteitis		1	1	1	0	9	3	15
Osteoarthritis		22	20	17	8	48	33	148
Osteoporosis		1	6	2	4	9	15	37
Periostitis		20	20	13	8	39	29	129
Rickets		5	4	3	4	4	4	24
Scoliosis		1	3	2	2	7	5	20
Spondylolysis		3	3	4	0	5	1	16
Surgical intervention		2	0	0	0	13	4	19
Trauma		12	4	12	7	24	11	78
Treponematosis		0	1	1	0	7	1	10

Appendix B:
Definitions of Conditions Examined

Disease	Definition
Ankylosis	"An abnormal, complete immobility of a joint, resulting from pathological changes in the joint" (White et al. 2012:577).
Congenital limb abnormality	Irregularity of the limbs, including all bones of the arms and legs.
Congenital skull malformation	Irregularity of the skull.
Congenital spinal disorder	Irregularity of the spine.
Cribra orbitalia (left and right)	"Lesions on the roof of the orbit, usually in the form of bilateral pitting of the orbital park of the frontal" (White et al. 2015:580).
Dental pathology	Disease or condition of the teeth, including bacterial destruction such as caries or social behavior such as pipe facets.
Diffuse idiopathic skeletal hyperostosis (DISH)	"A pathological condition characterized by the ossification of spinal" (White et al. 2012:581).
Erosive arthropathy	Erosive osteoarthritis.
Fracture (healed)	"A discontinuity (i.e. break) in bone" (Byers 2017:427) that appears to have healed.
Gout	"A disease due to a disturbance of the purine metabolism characterized by accumulation of . . . sodium urate . . . manifests as chronic gouty arthritis in its advanced stages" (Ortner and Putscher 1985:415-416).
Hyperostosis frontalis interna	Thickened lesions on the endocranial surface of the frontal bone due to changes in pituitary hormones (Ortner and Putscher 1985:294).
Joint disease (misc.)	General disease of the joints that could not be categorized under osteoarthritis.
Kyphosis	"The collapse of one or several vertebral bodies causing a sharp angle in the spine" (White et al. 2012:584).
Metabolic disease (general)	Irregular metabolic processes that appear in the skeletal body.
Osteitis	"Inflammation of bone tissue caused by infection or injury" (White et al. 2012:586).
Osteoarthritis	"Characterized by destruction of the articular cartilage in a joint and accompanied by bony lipping and spur formation adjacent to the joint" (White et al. 2012:586).
Osteoporosis	"Increased porosity of bone due to a reduction in bone mineral density" (White et al. 2012:587).
Periostitis	"A condition of inflammation of the periosteum caused by trauma or infection" (White et al. 2012:587).
Rickets	"A form of osteomalacia resulting from vitamin D deficiency" (White et al. 2012:589).
Scoliosis	"Lateral deviations of the spinal column from the midsagittal plane . . . usually shows a double curvature" (Ortner and Putscher 1985:324).
Spondylolysis	"The separation of a major portion of the neural arch from one or more vertebrae" (Ortner and Putscher 1985:357)
Surgical intervention	The presence of surgical alterations to the body
Trauma (accidental)	"A pathological category defined as injury caused to living tissue by an outside force" (Byers 2017:445) and which appears to have been accidental and non-deliberate.
Trauma (soft tissue)	"A pathological category defined as injury caused to living tissue by an outside force" (Byers 2017:445) and which appears to have damaged the skin and tissue beneath the skin.
Treponematosis	Bacterial infection that can cause syphilis (WHO 2019).

Appendix C:

Chelsea Old Church Database

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 18	F	36-45	Upper	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 19	F	>46	Upper	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Individual 20	M	36-45	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Individual 31	F	36-45	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 35	M	>46	Upper	0	0	0	0	1	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Individual 39	F	36-45	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 43	M	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Individual 92	F	18-25	Upper	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 96	F?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 100	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 104	F	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
Individual 115	F	>46	Upper	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 143	M	>46	Upper	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 147	M	>46	Upper	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
Individual 152	F	>46	Upper	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 154	M?	>46	Upper	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 161	F	18-25	Upper	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 188	M	>46	Upper	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 193	F	36-45	Upper	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 198	M	36-45	Upper	1	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Individual 218	F	>46	Upper	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 225	M	36-45	Upper	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 232	F	26-35	Upper	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 248	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 253	M?	>46	Upper	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 258	M?	26-35	Upper	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 261	M?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 274	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 285	M	36-45	Upper	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Individual 309	F?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 315	M?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 323	M	36-45	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 339	M	36-45	Upper	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Individual 343	M	36-45	Upper	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 349	M	18-25	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 353	F	26-35	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 359	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 363	F	18-25	Upper	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 392	F	18-25	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Individual 407	F	>46	Upper	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Individual 411	M	36-45	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 419	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 432	M	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 434	F	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	1	0	0	0	0	0	0
Individual 436	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 453	M	>46	Upper	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 460	M	18-25	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Individual 462	M	36-45	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 466	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Individual 474	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 483	F	>46	Upper	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 485	M	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 494	M	>46	Upper	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 496	M	>46	Upper	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 505	F	26-35	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 509	F?	>46	Upper	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 516	M	>46	Upper	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 525	M	>46	Upper	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 527	M?	>46	Upper	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 532	M?	36-45	Upper	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 552	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 567	F	26-35	Upper	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 583	F?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 587	F	>46	Upper	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 593	M	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0
Individual 597	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 622	M	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 628	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 638	F?	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 641	M	26-35	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 646	M?	>46	Upper	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 654	M	>46	Upper	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 668	M	>46	Upper	0	0	0	0	0	0	0	1	1	1	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 681	M	>46	Upper	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 697	F?	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 701	M	>46	Upper	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
Individual 713	M	>46	Upper	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 716	F	>46	Upper	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 722	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 730	F	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 734	M	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 739	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 744	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 750	M	>46	Upper	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 754	F	18-25	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0
Individual 759	M	>46	Upper	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 782	M	36-45	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Individual 790	F?	18-25	Upper	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 792	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 802	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 805	M	36-45	Upper	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 812	F	>46	Upper	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 819	M	>46	Upper	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 836	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 841	F	>46	Upper	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 856	M	26-35	Upper	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Individual 867	M	26-35	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 888	F	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0
Individual 892	F?	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 898	M	>46	Upper	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 910	F	>46	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Individual 918	F	>46	Upper	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 948	M	>46	Upper	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0
Individual 951	M	18-25	Upper	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 980	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Individual 994	M	36-45	Upper	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1001	F	18-25	Upper	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1004	M	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1014	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Individual 1016	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1018	M	26-35	Upper	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1021	M	>46	Upper	1	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1023	F	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0
Individual 1055	F	36-45	Upper	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1068	M	26-35	Upper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1071	M?	36-45	Upper	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 1126	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1140	F	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1157	M	>46	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1175	F?	36-45	Upper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Appendix D:

St. Benet Sherehog Database

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 12	F	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 13	F?	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 18	F	>46	Middle	0	1	0	0	0	1	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 19	F	>46	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Individual 20	F	>46	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0
Individual 35	M?	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 50	F?	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0
Individual 52	M	26-35	Middle	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 54	M	36-45	Middle	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 66	F	26-35	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 85	F	36-45	Middle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 88	M	>46	Middle	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Individual 90	M?	26-35	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 93	M	>46	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 96	M	>46	Middle	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 106	M	26-35	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Individual 114	F	>46	Middle	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 118	M	36-45	Middle	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Individual 134	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 142	M	>46	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 146	M	36-45	Middle	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 149	M	36-45	Middle	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 160	F	26-35	Middle	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 164	F	>46	Middle	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 173	F	>46	Middle	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Individual 176	M	>46	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 203	F?	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 210	M	26-35	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 223	F	26-35	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 227	M?	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 237	M	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 241	F	26-35	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 257	M?	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 265	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Individual 276	F	26-35	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 280	M	18-25	Middle	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 290	F?	>46	Middle	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 306	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 333	F	36-45	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 347	F	26-35	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 353	F	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 356	M	36-45	Middle	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 358	M	26-35	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 364	M	36-45	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Individual 371	M	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 377	M	>46	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Individual 379	F	26-35	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 387	M?	36-45	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 390	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 396	M	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Individual 407	M	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 421	M	26-35	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 433	F	>46	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 437	M	>46	Middle	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 443	M	26-35	Middle	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 447	M	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Individual 469	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 508	M	36-45	Middle	0	1	0	0	1	1	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 519	M	26-35	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0
Individual 523	M	>46	Middle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0
Individual 526	M?	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 533	M	>46	Middle	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 544	M	36-45	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 557	M	36-45	Middle	0	1	0	0	0	1	0	0	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 564	F	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 583	F	18-25	Middle	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 594	M	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 598	M	26-35	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 601	M	>46	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 624	M	36-45	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 629	M	18-25	Middle	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 642	M?	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathologies	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 676	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 684	M	36-45	Middle	1	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 691	F?	26-35	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 708	F	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
Individual 712	F	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0
Individual 719	F?	26-35	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 754	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 761	M	36-45	Middle	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 765	M	26-35	Middle	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 769	F?	>46	Middle	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 782	F	>46	Middle	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 852	M	36-45	Middle	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 857	F	>46	Middle	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 885	M	36-45	Middle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 894	M	36-45	Middle	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Appendix E:

St. Bride's Lower Database

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb Abnormality	Congenital Skull Malformation	Congenital Spinal Disorder	Cribra Orbitalia (Left and Right)	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis Interna	Joint Disease (misc.)	Kyphosis	Metabolic Disease (general)	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1200	M	>46	Low	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1500	M	>46	Low	0	0	0	0	0	1	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1052	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 1055	M	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1
Individual 1116	M	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1119	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1123	F	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 1125	M	>46	Low	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Individual 1126	M?	36-45	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Individual 1127	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 1141	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1151	F	>46	Low	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1155	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 1166	F	26-35	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Individual 1170	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1174	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1178	M?	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1184	M	>46	Low	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1199	F	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1203	F	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1207	F	26-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0
Individual 1209	M?	36-45	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1221	F	>46	Low	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1247	M	36-45	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia (Left	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis	Joint Disease (misc.)	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1251	M	>46	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1269	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Individual 1281	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Individual 1288	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1290	M	26-35	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1291	F	>46	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1292	M?	36-45	Low	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1298	M	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1312	M	36-45	Low	0	1	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0
Individual 1326	F	>46	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Individual 1336	F	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1338	M	36-45	Low	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1343	F	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Individual 1345	M	>46	Low	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1350	M?	>46	Low	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1355	M	26-35	Low	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1360	F	>46	Low	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1369	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1373	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 1376	F	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1390	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Individual 1408	M	>46	Low	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1409	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0
Individual 1415	M	26-35	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1417	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia (Left	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis	Joint Disease (misc.)	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1420	M	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 1439	M	>46	Low	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1441	F	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1457	M	26-35	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1474	F?	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1509	F	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1515	M	>46	Low	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1519	F	26-35	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1521	M	>46	Low	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Individual 1525	M	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1526	M	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Individual 1543	M	>46	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0
Individual 1546	M	36-45	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0
Individual 1547	F?	>46	Low	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1549	M	>46	Low	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1558	M	36-45	Low	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Individual 1563	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1
Individual 1578	M	36-45	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1591	M	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1606	M	>46	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Individual 1608	M	>46	Low	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1610	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1611	F	26-35	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1617	M	18-25	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1621	M?	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia (Left	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis	Joint Disease (misc.)	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1634	F?	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1635	M	>46	Low	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Individual 1637	F	>46	Low	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1645	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1653	F	26-35	Low	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1669	M?	>46	Low	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1673	M	36-45	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Individual 1680	M	>46	Low	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1685	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1687	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1689	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 1691	F	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1695	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1699	M?	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1703	F	36-45	Low	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1711	F?	36-45	Low	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1719	M?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Individual 1727	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1
Individual 1739	M	>46	Low	0	0	0	0	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1741	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
Individual 1743	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1745	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0
Individual 1753	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1755	F	26-35	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia (Left	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis	Joint Disease (misc.)	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1757	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Individual 1763	M	>46	Low	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	0
Individual 1767	M	18-25	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 1787	F?	26-35	Low	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1793	F	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1795	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
Individual 1797	M	>46	Low	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1799	F	36-45	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 1805	F	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1809	F	36-45	Low	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1819	M	18-25	Low	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Individual 1825	M	36-45	Low	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1827	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0
Individual 1829	M?	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 1831	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1853	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 1862	M	>46	Low	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1870	M?	>46	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1872	M	36-45	Low	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1874	F	>46	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1879	M	36-45	Low	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1881	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1883	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1885	M	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1887	F	>46	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1897	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1901	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia (Left	Dental Pathology	DISH	Erosive Arthropathy	Fracture (healed)	Gout	Hyperostosis Frontalis	Joint Disease (misc.)	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical Intervention	Trauma (accidental)	Trauma (blunt force)	Trauma (soft tissue)	Trepenomatosis
Individual 1903	F?	36-45	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0
Individual 1905	M	>46	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0
Individual 1913	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 1932	M	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Individual 1938	M	18-25	Low	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
Individual 1940	F?	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 1942	M?	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 1946	F	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1954	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Individual 1957	M	36-45	Low	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1959	M	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1967	M	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 1972	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Individual 1976	M	>46	Low	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1983	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1990	F	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 1991	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1993	F	>46	Low	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
Individual 1995	F	18-25	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 1997	M?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 1999	M	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Individual 2001	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2005	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Individual 2011	M	>46	Low	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia	Dental Pathology	DISH	Erosive	Fracture (healed)	Gout	Hyperostosis	Joint Disease	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical	Trauma	Trauma (blunt	Trauma (soft	Trepenomatosis
Individual 2015	M	36-45	Low	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Individual 2023	M	>46	Low	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 2029	M	>46	Low	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2043	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 2049	F	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2053	M?	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 2058	M	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 2061	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2065	F?	>46	Low	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0
Individual 2071	F?	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Individual 2073	F	>46	Low	0	1	0	0	0	1	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2075	M	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
Individual 2077	M	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2083	F	>46	Low	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2105	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2107	M	18-25	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 2109	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2111	M	>46	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2116	F	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2118	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Individual 2120	M	>46	Low	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2122	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2124	M	26-35	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2126	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia	Dental Pathology	DISH	Erosive	Fracture (healed)	Gout	Hyperostosis	Joint Disease	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical	Trauma	Trauma (blunt	Trauma (soft	Trepenomatosis
Individual 2130	M?	>46	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2132	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2134	F	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2136	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2138	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Individual 2140	M	26-35	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 2142	M	>46	Low	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2144	F	26-35	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2148	M	36-45	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
Individual 2152	M?	>46	Low	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Individual 2154	F?	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
Individual 2158	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2161	F	26-35	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 2164	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0
Individual 2165	M	26-35	Low	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2171	F	26-35	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 2189	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Individual 2191	M?	>46	Low	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0
Individual 2193	M	>46	Low	0	1	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Individual 2195	M	>46	Low	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Individual 2205	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2207	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Individual 2209	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 2214	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2216	F	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0
Individual 2233	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 2237	F	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Individual 2243	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Individual ID	Sex	Age	Class	Ankylosis	Congenital Limb	Congenital Skull	Congenital Spinal	Cribra Orbitalia	Dental Pathology	DISH	Erosive	Fracture (healed)	Gout	Hyperostosis	Joint Disease	Kyphosis	Metabolic Disease	Osteitis	Osteoarthritis	Osteoporosis	Periostitis	Rickets	Scoliosis	Spondylolysis	Surgical	Trauma	Trauma (blunt	Trauma (soft	Trepenomatosis
Individual 2253	M	>46	Low	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0
Individual 2255	F	36-45	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0
Individual 2263	M	36-45	Low	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
Individual 2269	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0
Individual 2274	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1
Individual 2284	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0
Individual 2296	M	>46	Low	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2302	M?	26-35	Low	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Individual 2304	M	>46	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2308	F	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2313	M	>46	Low	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2314	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Individual 2332	F	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Individual 2340	M	36-45	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2342	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Individual 2353	F	36-45	Low	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2356	M	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2366	M	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Individual 2383	F	36-45	Low	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	1	0
Individual 1883.1	M?	36-45	Low	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Individual 2245.1	F	>46	Low	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Individual 2284.1	M?	36-45	Low	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix F:

The Enraged Musician **(1741) by William Hogarth (1697-1764)**

Appendix G:

Four Times of the Day: Morning **(1738) by William Hogarth (1697-1764)**

Appendix H:

Gin Lane (1751) by William Hogarth (1697-1764)