THE INTERSECTIONS OF SEX AND INEQUALITY IN A MIXED STATUS INDUSTRIAL LONDON SAMPLE

by

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ABSTRACT

Saint Pancras Burial Ground and its inhumated priests, paupers, aristocrats, and migrants provide a unique perspective into the interactions between sex and inequality in 18th and 19th century industrial London. Frequencies of caries, dental calculus, periodontal disease, linear enamel hypoplasia, periapical lesions, tuberculosis, treponematosis, rickets, and trauma among 224 females from St. Pancras were compared to 27 low-status females from Crossbones Burial Ground and 74 primarily high-status females from Chelsea Old Church Cemetery. Based on the information known about those buried at St. Pancras, it was hypothesized that the frequencies of health indicators in St. Pancras should fall between the high and low status cemeteries.

For this research, Pearson Chi-square was used to test if differences in frequencies were statistically significant. The results show that for St. Pancras the frequencies were significantly lower ($p<0.005$) than Crossbones for caries (SP=61%, CB=88%), periodontal disease (SP=42.2%, CB=96%), periapical lesions (SP=8.7%, CB=40%), and trauma (SP=11.6%, CB=37%). Frequencies of dental calculus (SP=81%, CC=95.1%), periodontal disease (SP=42.2%, CC=67.5%), and periapical lesions (SP=8.7%, CC=31.1%) were also significantly lower ($p<0.05$) in St. Pancras compared to Chelsea Old Church. However, St. Pancras's prevalence of LEH (80.8%) was significantly higher ($p<0.05$) than Chelsea Old Church (56.1%). Overall, the individuals from St. Pancras had better dental health compared to the other two samples and lower frequencies of trauma compared to Crossbones. This suggests that circumstances, such as migration, may have

uniquely affected the lived experiences of women from the St. Pancras sample when compared to other local samples.

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CB	Crossbones
CC	Chelsea Old Church
SP	St. Pancras
LEH	Linear Enamel Hypoplasias
PD	Periodontal Disease
PL	Periapical Lesions
TB	Tuberculosis
Trep.	Treponematosis

CHAPTER ONE: INTRODUCTION

The knowledge gained from analyzing the intersections of inequalities in the past can help researchers understand similar interactions in the present. This allows for the development of mitigatory measures when addressing inequality in the present by expanding our knowledge about possible sources of social inequity and its produced health outcomes, such as stress and disease (Zuckerman 2019). Bioarchaeological analysis are becoming increasingly inclusive and contextual. However, there are relatively few studies in the field that attribute individual agency to women in their approaches to intersectional inequality.

Archaeology is a historically androcentric field, and this extends to the subfield of bioarchaeology as well. When looking for bioarchaeological information on women in the past, articles where they are compared to men or chapters in which children's health is the focus are readily available. Less frequent are bioarchaeological analyses that focus on exclusively women's lived experiences in a way that acknowledges their agency.

However, this trend is changing. In recent years, some bioarchaeologists have analyzed women's lived experiences in this exclusive, agency-acknowledging framework. In their 2010 article "Beaten Down and Worked to the Bone: Bioarchaeological Investigations of Women and Violence in the Ancient Southwest", Debra Martin and colleagues studied women's roles and motivations with regards to violence in the American Southwest (Martin, Harrod, and Fields 2010).

More recently, The Bioarchaeology of Structural Violence: A Theoretical Framework of Industrial Era Inequality (2020) includes a section on gender inequality containing four chapters. The last chapter of the volume was authored by Sarah Mathena-Allen and Molly Zuckerman (2020) and compares women's health in different regions in industrial Britain.

In this project, the lived experience of women living amid an industrialized London will be reconstructed. The primary focus will be on the St. Pancras burial sample, and one low status cemetery and one high status cemetery will be used for comparison.

This project will analyze pathological data gathered from The Museum of London's Wellcome Osteological Research Database and contextualize it using socioeconomic and environmental historical information. By doing this, the root causes of unequal health outcomes in women may be identified.

The Industrial Period in London

In order to add to the growing bioarchaeological literature that acknowledges the agency of females, industrial London was selected as the time period for this analysis. The cultural shifts in London prior to and during the Industrial Revolution, which began in the latter half of the 18^{th} century, lead to high levels of social stratification, which provides grounds for research on inequality. The industrial period's improvements in agricultural and transportation efficiency increased the need for industry workers, bringing a plethora of people and problems into London. The infrastructure of the city could not keep up with the population growth. Human, animal, and industrial waste littered the streets, homes, water, and air, and hygiene was poor across the board. Lower status individuals faced the worst of this in London's slums and were often stigmatized, as seen in the discussion of the 1834 Poor Laws in Chapter II of this thesis. New industrial jobs were opening up for both men and women, and thus new hazards arose. Those most affected by this were the poor (Daunton 1995; Barker and Chalus 2005).

As social stratification increased, the differences between the lives of the poor and the wealthy grew more readily apparent. The diets became more varied or nutritionally dense as status increased, and while the rich feasted, the lowest status individuals were hovering around the starvation line. The 1834 New Poor Laws reflected changing opinions on poor people. To be destitute was seen as the moral fault of the individual, and those who fell were regularly dehumanized. With work being mandatory for aide, workhouses were then painted as places for the destitute to learn moral responsibility and social discipline (Shields Wilford and Gowland 2019).

Before and during the Industrial Revolution, what was seen as women's work was ever shifting, and the Enlightenment ideal of the wife as a good homemaker was becoming increasingly inaccessible to all but the richest. Women made significant economic contributions and worked in both traditionally feminine and sometimes masculine fields. Understanding the jobs in which London women participated in could shed light on pathological patterns seen later in the data analysis portion of this project.

The first aim of this research was to add to the growing understanding of the differences in women's lived experiences of inequality in an industrializing London. To do this, the health profile for the widely variable sample from St. Pancras Burial Ground was compared to two other samples from Crossbones Burial Ground and Chelsea Old Church Cemetery, which were low-status and high-status respectively. In order to conduct this analysis, published data on adult females were collected from their associated monographs. Frequencies of each pathology were calculated for the burial samples, including dental pathologies, two infectious diseases, rickets, and trauma. SPSS was used to run a Pearson Chi-square test on the data in order to determine associations between status and rate of pathology. Considering the complexity of St. Pancras's Third Ground's burial sample and the variation in the lived experiences of these individuals, it was hypothesized that St. Pancras's pathological frequencies would fall somewhere between the high and low-status samples.

A Feminist and Gendered Theoretical Approach

This analysis uses a feminist theoretical approach to inequality. Feminist and gendered theory incorporates key issues that archaeologists, especially bioarchaeologists, are uniquely poised to address such as inequality and agency (Conkey and Gero 1997).

Out of all the different branches of archaeology, feminist archaeology lends itself best to bioarchaeology. This is because bioarchaeology contains some of the most direct evidence of the impacts of social inequality relative to the rest of archaeology.

Particularly, skeletal analysis is useful in analysis of power, inequality, and violence on the bones (Armelagos 2003).

A primary goal of gendered archaeology is to include the lived experiences of women in archaeological analyses. Feminist archaeology introduced gender theory to archaeology. Zuckerman and Crandall (2019) give an apt summarization of how gender is viewed in the more recent years of this framework:

> "Gender is viewed as a pervasive system of social stratification, which structures relationships, signifies power—and its absence—and moderates access to resources" (Zuckerman and Crandall 2019, 163).

Previous approaches attributed skeletal differences between males and females to biology. A gendered theoretical approach analyzes what could have caused these differences, deemphasizing biological sex. Bioarchaeologists whose work has been influenced by this approach examine how factors outside of the biological body influence the individual, such as sexual divisions of labor and cultural norms.

In turn, the integration of gender theory into bioarchaeology allows for a more robust and nuanced understanding of inequality (Martin, Harrod, and Pérez 2013).

Biological sex is just one aspect of an individual interacting with their environment. Its effects function within multi-dimensional conceptual framework that includes categories like age, social identity, health, personal agency, and more. This opens up the field to more potential research questions and theoretical considerations (Zuckerman and Crandall 2019).

It is important that researchers do not conflate sex and gender in their analysis of human remains. Those who differentiate the two emphasize the importance of socially constructed gender. There have been multiple ethnographic, historic, and archaeological reports of genders outside of the binary. Keeping this in mind not only allows for more accurate analysis, but it creates an environment in which nuanced research questions about gender can thrive (Martin, Harrod, and Pérez 2013).

Sex identification has long been a staple of bioarchaeology. However, more and more researchers view biological sex not just as “male” or “female”; there is a spectrum between the two. In the middle lies people who are intersex. However, it is not really possible to accurately determine if an individual was intersex with the methods currently available to bioarchaeologists outside of DNA analysis. There are those that critique the use of a sex-binary identification system. Martin, Harrod, and Perez (2013) point out that not even the methods used to identify the sex of an individual are binary. Those categories are as follows: female, probable female, ambiguous, probable male, and male (Buikstra and Ubelaker 1994).

Social bioarchaeology is the branch of archaeology that most embraces this contextual analytical approach. Its ideas most align with third-wave feminism. These bioarchaeologists view skeletal remains as being biologically and socially produced. Social bioarchaeology's multi-faceted contextual approach can allow researchers to reconstruct social identities and lived experiences (Zuckerman and Crandall 2019).

While skeletal remains can provide a different perspective than other branches of archaeology, bioarchaeology's diagnostic capabilities are limited. Many aspects of health are not measurable via the skeleton, and only a few diseases leave skeletal evidence. Those diseases that do are often not individually identifiable. However repeat or prolonged exposure to stressors can leave interpretable marks such as periosteal reactions and linear enamel hypoplasias (Zuckerman and Crandall 2019). Since the formation and maintenance of bone is controlled by social as well as biological factors, hypotheses based in Feminist Archaeology are empirically testable because the evidence of differential nutritional and physiological stress is often quantifiable.

Lastly, it must be emphasized that biological sex does not equate to gender. Due to the nature of gender divisions in Victorian London, it is likely that biological females would have been perceived as women and would navigate the world as such. However, there is documentary evidence that females did take on more "masculine" roles (Barker and Chalus 2005). Bioarchaeological analyses are limited in their ability to assign gender to individual remains, as gender is a continually shifting social construct. While biological sex is used in this analysis as the nearest proxy to gender due to the nature of the data, it is only done so in the broadest sense and with full acknowledgement of the limitations of that application.

CHAPTER II: BACKGROUND

Historical Background

To properly contextualize the St. Pancras sample, the environment in which all these individuals inhabited must be understood. In this section, there is a discussion of the different aspects of industrial London that could have affected the groups that the burial samples represent. The burial samples used in this analysis provide a view into the interactions between sex and inequality in industrial London.

The Path Towards Industrialization

The industrialization of Britain began with the Reformation in the 16th century, which brought Britain out of the medieval period. This led to population growth, which encouraged increased agricultural efficiency (Roberts and Cox 2003). Increases in agricultural output allowed for an increase in industry workers (Daunton 1995). This growth in demand fueled innovations that eventually culminated in the Industrial Revolution.

Transportation of supplies and people became more efficient throughout the post medieval period with the increased utilization of canals, the invention of the steam engine, and the eventual construction of railways. Urban growth is generally limited by the amount of available fuel for heating and cooking (Daunton 1995). England could easily navigate this issue due to the availability of coal in the Northeast, and it was responsible for over half of Europe's 18th century population growth. As a result, by the middle of the 19th century, urban centers held 50% of England's population. This was driven by the droves of rural British people moving into cities for industrial work. Suburban areas developed alongside an increase in urban population density (Roberts and Cox 2003), and this was certainly true for London, the most prominent industrial center in England (Daunton 1995). Accordingly, the population of London went from 5.5 million at the beginning of the 18th century to 9 million by the beginning of the 19th century (Roberts and Cox 2003).

Industrial London

Industrialization in London brought a plethora of problems onto its populace. Human, animal, and industrial waste littered the streets, homes, water, and air. Frequent cholera epidemics unsurprisingly correlate with a sharp increase in London's population density and waste accumulation. Despite the development of inoculation measures, smallpox outbreaks remained an issue well into the 19th century. Poor living conditions also exacerbated the louse-borne illnesses and the tuberculosis epidemic in London. Working conditions were not much better. The absolute and relative standard of living was extremely low for poor people, and even the wealthy could not escape all of London's pitfalls (Daunton 1995).

Map 2.1 Location of London within the British Isles (NordNord West 2008)

Living Conditions

The rapid population growth discussed above gave rise to the notoriously large gap in living conditions between poor and wealthy Londoners because it was ill-equipped to handle this rapid population increase. Poor families were shuffled to the most run-down areas of London to make room for road and railway development, a process called slum clearance. They were often relegated to a single unventilated room, be it a cellar, an attic, or a ground-level room. The 19th century saw the introduction of plumbing to some housing, but it was unreliable even if the family was lucky enough to live in these homes, which was uncommon (Roberts and Cox 2003).

Animal and human refuse also piled up in the streets of London (Roberts and Cox 2003). Animals were often brought to London for slaughter to fuel related industries, such as the meat and tanning industries (Daunton 1995). Their refuse added to that of the residents and their animals. During inclement weather, families living in cellars— often poor families— experienced a deluge of saturated waste into their homes. This waste infiltrated both the ground water and the river water sources. Even wealthier individuals were affected by this waste disposal issue due to the high population density. Attempts to reroute waste or otherwise mitigate the issue generally had little to no effect (Roberts and Cox 2003). Waste from various factories polluted the water supply, compounding the effect of pollution caused by human and animal wastes. The inaccessibility of clean water led to poor hygiene in working-class Londoners despite the increase in accessible cotton materials. Poor water quality fueled a range of diseases, from slight infections to lethal epidemics; body lice, fleas, and ticks were prominent, as were their associated borne illnesses, such as typhus. The use of straw bedding and the lack of ventilation exacerbated this (Roberts and Cox 2003; Wohl 1983).

The poor living conditions of industrial London were a breeding ground for multiple diseases, including cholera. The introduction of Asiatic Cholera in 1831 led to multiple epidemics throughout the Industrial Revolution (Underwood 1948). There were four Asiatic Cholera epidemics in Britain that killed 115,977 people in total: 1931- 1932, 1848-1849, 1853-1854, and 1866-1887 (Gill 2000; Wohl 1983). Abysmal waste disposal caused the multiple cholera outbreaks that occurred throughout this period (Roberts and Cox 2003). When individuals contracted this disease, they would often suffer for multiple days with vomiting and diarrhea, which would contaminate the water supply due to poor waste management. The bacteria could live for two weeks in water, meaning the chances for exposure were even higher. Cholera could be spread via food contamination as well. Typhus was also exacerbated by living conditions. Being spread by body louse, it could be easily spread in the tightly packed slums of industrial London (Wohl 1983).

The steam engine induced increases in coal usage compounded with the population density of London filled the air with toxic smog (Roberts and Cox 2003). This extended miles beyond London itself. Smells from slaughterhouses, cement factories, and other industries in London permeated the city. Along with the direct negative health consequences of air pollution, secondary impacts could be seen in individuals closing their source of ventilation in an attempt to block the soot and smell out, and doing so increased the household's infection risk. They could also be seen in the use of household fuel to wash soot covered garments instead of using that fuel for cooking (Wohl 1983).

As a result of agricultural intensification and the increase in its efficiency, London's population was buffered from short-term famine consequences, though extreme famine could still cause issues. A wider variety of foods was introduced to Londoners, but only those who could afford it could access it. The middle and upper class were infamous for their level of food consumption in this regard. Poor households' diets generally consisted of bread, sugar, tea, potatoes, beer, butter, and cheese (Robert and Cox 2003; Shields Wilford and Gowland 2019). Poor households also did not often have access to cooking spaces or adequate fuel for cooking (Roberts and Cox 2003).

The Working Class

The lower-classes were the most vulnerable to the negative consequences of these poor living conditions. English workers experienced a relatively poor rate of improvement relative to wealthier classes. They could easily perceive this inequality and it exacerbated negative feelings about their status. Employers could deduct from worker pay at the employer's discretion in hard times. This even occurred when workers were paid upfront, which left them in debt to the employer at the end of their work. Even though being paid in cash was agreed upon, workers were often forced to accept pay in the form of distribution of goods via company-ran distributors. Workers could utilize surplus such as spilled commodities and woodchips. Thus, these excess products were often sold by the workers as extra income in an attempt to mitigate losses felt elsewhere (Daunton 1995).

New work hazards arose with increasing mechanization. Instances of injuries caused by machinery and repetitive strain, fumes inhalation, and hearing damage from noisy machinery were all on the rise, and more specific issues could come with more specific occupations, such as matchmakers and phosphorus poisoning (Roberts and Cox 2003). These new hazards likely led to the exponential increase in fracture-attributed deaths that occurred in the first half of the 19th century (Roberts and Cox 2003)

Women and Work

Though wage rates are usually measured by male income, women were recorded to have contributed as much as 23% to the family's budget by either participation in wage work or production of goods for family use (Daunton 1995), and they worked across a variety of fields, though those fields were relegated to certain classes. The higher the status, the more traditionally "feminine" the work needed to be. Low and middle status women were practically expected to assist in the economic aspect of the household (Mathena-Allen and Zuckerman 2020). The movement of women into the industrial workforce was stated by Barker and Chalus (2005) to be due to the reduction in artisanal apprenticeship opportunities in the late eighteenth century. They argued that men were threatened by women practicing artisanal work, and various crafts were blocking women from entering the field, such as silk-weaving and bookbinding. Barker and Chalus (2005) argue that the idea of a reduction in available women's work lacks nuance, and that what was seen as women's work was ever shifting.

The Enlightenment dictated that a "good woman" was a home-maker, her life revolving around the family (Barker and Chalus 2005), but this ideal was increasingly inaccessible to poorer women because they had to participate in the labor force, ultimately drawing them away from that family. If a lower-class family could afford the fee for sending their daughter to a parish school, she would be molded into what those in power deemed acceptable, being taught things like religion, reading, and household tasks like needlework. This also prepared them for the workforce. This schooling, though not as thorough as that of the higher classes, allowed for some poorer girls to have some social mobility. Those who could not afford it were further stuck in the cycle of poverty the lower-class in London constantly faced (Barker and Chalus 2005). Workshops provided higher wages for women than other options, although they were still paid worse than their male counterparts. The work women did was often delicate, labor-intensive work such a calico-printing, design painting, and button-making. Employers employed women for these tasks because male laborers would organize and demand more pay. Women also took up domestic production of goods and services. As a result, the period between 1700 and 1850 saw an increase in the education of women to teach them these womanly skills such as tailoring (Daunton 1995), which in turn made them ideal industrial workers in these fields.

Poor Laws and the Workhouse

In order to understand the gap between upper-class and lower-class Londoners, the perceptions of poor people by society must be understood. Poor law legislation from the turn of the 17th century required parishes to care for the destitute and provide work for those who were able. Funds were the responsibility of the state, and there was no standardization in aid distribution on the national level, and this aid was generous (Daunton 1995). Parish workhouses were created that gave opportunities to work and a place for the indigent (Daunton 1995; Shields Wilford and Gowland 2019). Leading up to the 1834 New Poor Laws, the opinions of poor people were shifting (Shields Wilford and Gowland 2019). England's elite believed they were the epitome of human civilization, and the conditions of the poor flew in the face of this. To make amends with this apparent contradiction, society associated morality with one's outcome in life. To be destitute was the fault of the individual, and those who fell were regularly dehumanized (Brown 2006). Even though poor people who were disabled generally made up a majority of poor law costs, the debate was centered around able-bodied poor (Daunton 1995).

With the introduction of the New Poor Laws in 1834, London's approach to maintaining the community changed to relying on "insistence on order, efficiency, social discipline, and a concern with the conditions of men" (Rosen 1958, 112). To prevent possible abuse of the system by able-bodied poor, union workhouses required hard labor to receive aid—if the person was able. It was argued that this would keep criminals out of trouble and teach children the importance of work ethic (Daunton 1995). Workhouses were more of a threat and punishment to poor people than a place of optimistic opportunity. It prioritized industrious virtues (Shields Wilford and Gowland 2019). Union workhouses aimed to address issues of criminality and vagrancy, though those attempts never truly alleviated the problem (Brown 2006).

The diets changed with this shift to union workhouses, as shown by Shields Wilford and Gowland (2019). Parish workhouse menus usually consisted of little outside of beer, bread, butter, and cheese, beer and bread being the most common staple. Union workhouses diversified the menus, including meat and other items. However, according to Shields Wilford and Gowland (2019), Union workhouse diets fell short of the caloric intake seen in the parish workhouse diet. The caloric intake seen in the London Union diet was only about 60% of the recommended daily caloric intake for the work being done in the workhouses. This is only 10% above the starvation line. (Shields Wilford and Gowland 2019).

Science and Health

The Enlightenment led to significant improvements in science and medicine, and this continued to improve leading up to the Industrial Revolution. The correlation between poverty and disease began to be recognized near the turn of the 19th century, and Edwin Chadwick acknowledged this link at the 1839 Poor Law Board (Roberts and Cox 2003; Rosen 1958). The government began trying to mitigate health issues in earnest starting in the beginning of the 19th century. There were developments, discoveries, and health initiatives regarding the reduction of disease, but those had little impact on the lives of poor people due to the systematic inequality issues rampant in industrial London (Roberts and Cox 2003; Mathena-Allen and Zuckerman 2020). Medical care was done in the home if it could be afforded. Hospitals were usually for the poor, and they could be breeding grounds for infection (Roberts and Cox 2003).

The oral hygiene methods of industrial London were not optimal. The goal was whitening, not true maintenance, and their methods of doing so primarily consisted of rubbing the teeth with different substances. Some of these methods were harmful and damaged the enamel (Roberts and Cox 2003). Dental stress indicators in females were high, including early life indicators. Infectious diseases like tuberculosis and treponematosis –commonly referred to as syphilis – were rampant in industrial London, and women were commonly affected, though rates in high-status women were generally lower (Mathena-Allen and Zuckerman 2020).

In women's health, there was a shift in obstetrics from midwives to physicians, surgical intervention in pregnancy became more common. However, this shift did not significantly improve maternal mortality rates (Roberts and Cox 2003). As demonstrated by Mathena-Allen and Zuckerman (2020), women in England were particularly vulnerable to power and inequality-related stressors.

Samples

St. Pancras

St. Pancras Old Church has a longstanding history, officially dating back to the 12th century and possibly even existing prior to that. This sample comes from the cemetery's "Third Ground", which was in use from 1793 to 1854. This was divided into three periods, which became increasingly crowded and less organized in its burial practice as urban areas expanded and multiple cholera epidemics ravaged the local populace. This led to a rise in pauper burials and culminated in a third period characterized by mass graves and the eventual closure of the burial ground in the 1850s (Emery and Wooldridge 2011).

The sample at St. Pancras is unique in that it contains a wide range of individuals of varying status and socioeconomic circumstances. Though a large portion of the sample was poor and working class, there were many high-status, named individuals interred here, including those from nobility and clergy. Documentary sources also claim that the sample contained both poor and wealthy migrants from the French Revolution, such as Chevalier d'Éon – the well-known androgynous diplomat (Emery and Wooldridge 2011; Carpenter 1999).

The French Revolution and Catholic Pancras

Immigration into England from France started to pick up at the beginning of the French Revolution– 1789. Many of those who immigrated during this time saw London as a temporary respite from the rising tensions in France. As the period between 1789 and 1791 progressed, more restrictions were put onto nobility and clergymen, and those who had fled were threatened with various punishments, from high taxes, cessation of income, and possibly death (Carpenter 1999).

Driven by the increased turmoil in France, those who immigrated in 1792 were the first true "refugees" (Carpenter 1999) and were more destitute than the previous émigrés— a term used to refer to these French migrants. Most émigrés at this point were possessionless, due in part to the treacherous boat trip that brought them being inundated with storms. Clergymen were often among the émigrés due to their refusal to abide by the Civil Constitution. They were considered laity upon arrival in London. However, the powerful in the city decided that it was the clergy who would be deemed a priority above other lay people in regard to aid distribution (Carpenter 1999).

The poor émigrés settled in the area around St. Pancras, facing the same sanitary problems as other London slums: little ventilation, high levels of disease, and poor sanitation. The former nobility and lay people that lived in the area were just as impoverished as those who were from the slums of London. Those émigrés who were able to come to London with wealth generally settled south of the Thames. The unifier between these two groups was their Catholicism and the St. Pancras Burial Ground (Carpenter 1999)

As stated previously, St. Pancras Burial Ground was a popular final destination for Catholics, which included most of the émigrés mentioned previously (Emery and Wooldridge 2011). This was because the French were allowed to use the Anglican church there as long as the services were Anglican. What is particularly notable is that, despite this requirement, London officials generally looked the other way when funerals were held. This allowance of Catholic funerals in the decidedly anti-Catholic city of London drew a lot of Catholic people to the cemetery. In fact, it was the only place they could be buried with Catholic rights for quite some time (Carpenter 1999). This led to it being colloquially named "Catholic Pancras" (Emery and Wooldridge 2011). As a result, both the wealthy and the destitute were buried there.

Crossbones

Crossbones Burial Ground is a low-status cemetery located in St. Savior's Parish, Southwark. In the 16th and 17th centuries, it was used as a single women's burial ground. However, those inhumations were likely removed through its constant use once it transitioned to being a parish burial ground around 1800 (Wellcome Osteological Research Database). It was closed in 1853 after years of complaints from residents about the poor state of the burial ground. During this period of usage, it was a site for poor and parish– or pauper–burials (Brickley et al., 1999).

Chelsea Old Church

Historically, Chelsea has experienced some form of human occupation since before the Roman period. It sits on the north bank of the River Thames. Prior to urban expansion and encroachment, it was east of London. Its prime location made it a popular respite for the elite and occasionally served as an escape from bouts of the plague. Occupation of this area was divided into six periods. This research focuses on period six, which lasted from the 18th to the 19th century. This period saw a slow but persistent growth towards being a London suburb as the city's urban sprawl consumed more of the areas surrounding the city (Cowie et al., 2008).

Chelsea Old Church Cemetery was used during the area's 6th period and the approximate dates of the its usage were determined to be 1712-1842 based on the coffin plates associated with the burials. The cemetery primarily consisted of high-status individuals, but due to a workhouse in the town and increasing urbanization, inhumations of poorer individuals became more common (Cowie et al., 2008).

CHAPTER III: MATERIALS AND METHODS

Materials

Published data from 3 cemeteries were used in this analysis, and these data were gathered from The Museum of London's Wellcome Osteological Research Database (Wellcome Osteological Research Database) as well as each cemetery's associated monograph (Emery and Wooldridge 2011; Brickley, Miles, and Stainer 1999; Cowie, Bekvalac, and Kausmally 2008). The primary focus will be on the St. Pancras burial sample. In order to understand and contextualize this burial sample, one known low-status cemetery and one known medium to high-status cemetery from industrial London will be used for comparison: Crossbones Burial Ground and Chelsea Old Church Cemetery.

St. Pancras (SP)

The Third Ground of St. Pancras Burial Ground was in use between 1793 and 1854. Excavations of burial ground unearthed 224 identifiable females. The sample consists of individuals from a variety of socioeconomic statuses and backgrounds, including French migrants (Emery and Wooldridge 2011).

Crossbones (CB)

The Crossbones Burial Ground sample contained 27 identifiable females, and it constitutes the low-status sample of this analysis. It was used as a parish in the first half of the 19th century approximately from 1800-1853 (Brickley, Miles, and Stainer 1999; Wellcome Osteological Research Database).

Chelsea Old Church (CC)

The Chelsea Old Church Cemetery sample contained 74 identifiable females, and it constitutes the high-status sample of this analysis. Use of the cemetery was approximately from 1712-1842 (Cowie, Bekvalac, and Kausmally 2008).

Methods

Sex Estimation

Skeletal analysis was performed by the authors of the monographs using established methods (see Brickley, Miles, and Stainer 1999: Cowie, Bekvalac, and Kausmally 2008: Emery and Wooldridge 2011). For this project, probable females are included in the analysis.

Pathology

Only pathologies that were categorized by sex in all three datasets were selected for use in this analysis. These primarily included dental pathologies, but data for two infectious diseases, a metabolic disorder, and trauma were also available and similarly reported between all sources.

Dental Pathology

Dental pathology can prove to be a fruitful line of investigation about health and status because dentition can be influenced by various aspects of culture (Aufderheide, Rodriguez-Martin, and Langsjoen 1998), including living conditions and dietary patterns that are often products of social status (Alt, Rösing, and Teschler-Nicola 1998). Selected dental pathologies were used as the primary method of investigation into health due to their documentation among all three samples. These include dental caries, dental calculus, and periodontal disease.

Dental caries are caused by acids released by microorganisms, such as those found in plaque. The enamel and dentin are progressively eaten away by these acids, and without mitigation, this process will eventually reach the pulp. The tooth will then fall out, and then the alveolus will be reabsorbed. In some cases, inflammation will spread to the surrounding bone instead of reabsorption of the alveolus (Alt, Rösing, and Teschler-Nicola 1998). High rates of dental caries can result from developmental malnutrition and high carbohydrate diets (Ortner 2003; Alt, Rösing, and Teschler-Nicola 1998). This is due to the high levels of lactic acid produced in the rapid metabolization of carbohydrates in high-sugar diets.(Alt, Rösing, and Teschler-Nicola 1998).

Periodontal disease is an inflammatory response to an oral irritant (Ortner 2003) and is often caused by a buildup of dental calculus — which is mineralized plaque. Metabolic diseases like scurvy and protein deficiency have also been linked to periodontal disease (Ortner 2003). There is debate on whether diet and nutrition variation play a role in the frequency of periodontal disease (Alt, Rösing, and Teschler-Nicola 1998).

Because of its association with dental caries and periodontal disease, dental calculus is used supplementarily here to better contextualize the dental caries and periodontal disease statistics. Dental calculus is mineralized buildup of food left on the teeth, and it is found rather commonly among archaeological remains (Alt, Rösing, and Teschler-Nicola 1998).

Linear enamel hypoplasias, heretofore also referred to as LEH, are lines or grooves in the enamel that indicate a disruption in growth and can be due to prolonged bouts of stress caused by malnutrition or disease that generally occur between 1 and 4 years of age. Analysis of early childhood stress is often done through the observation of linear enamel hypoplasias. Tooth enamel development is well documented and highly regular, so it is possible to use LEH to track the chronology of stress-related disturbances during development (Goodman and Rose 1991). However, these enamel defects are limited in their usage. This chronology is generalized and not always entirely accurate (Larsen, 2002). LEH do not indicate the specific cause of stress and are best used in conjunction with other indicators, though research has suggested that they are relatively sensitive to nutritional disruption (Goodman and Rose 1991).

Periapical lesions are often a result of pulpal infection. This inflammation can be caused by caries or attrition, and it is identified by observing changes at the apex of the tooth. These lesions can lead to life-threatening abscesses in those with a weakened resistance (Alt, Rösing, and Teschler-Nicola 1998).

Infectious Disease and Rickets

Tuberculosis (TB) and treponematosis (syphilis) were two relatively common infectious diseases during the Industrial Revolution (Rosen 1958). They are of particular interest to this analysis because they have the potential to leave distinguishable traces on bone. Data on the frequency of these pathologies were collected for all three sites.

Human to human transmission of TB is caused by *Mycobacterium tuberculosis*. Tubercle bacilli tend to be located in the red marrow of the cancellous portion of bone (Ortner 2003). In adults, this accumulates in the metaphyses and epiphyses of long bones as well as the ribs, the vertebrae –particularly the lower spine– and the sternum.

Sexually acquired treponematosis (syphilis) is caused by *Treponema pallidum* bacteria, and has four stages: primary, secondary, latent, and tertiary. Skeletal involvement generally begins in the tertiary stage 2-10 years after initial infection, though that range can vary. This involvement can be identified by the presence of caries sicca– a clustering of crater-like lesions often seen on the frontal and parietal. It is primarily seen in the cranial vault, nasal cavity, and tibia. However, it is possible to see the infection in cancellous bone rich in hematopoietic marrow such as the ribs, sternum, and other long bones. These skeletal changes are often caused by a combination of chronic nongranulomatous inflammation and gummatous processes, but they can also result from individual instances of each (Ortner 2003).

Rickets, or osteomalacia in adults, is a condition caused by having limited exposure to ultraviolet rays, meaning not enough vitamin D is produced. This means calcium and phosphorus metabolization necessary for proper bone growth and maintenance is hindered. Rickets is rarely developed after age 4. Either way, the possible skeletal expressions are the same: the osteocartilaginous junction of the ribs experience rounded nodular swelling, deformation of the metaphysical ends of long bones (often resulting in bowed legs), and irregular development of the cranium. Genetic mineral absorption issues can also cause this disease, but, for the purposes of this analysis, we will assume that the lack of vitamin D is the issue, since one of the environments that restricts UV exposure is crowded cities (Ortner 2003).

Trauma

Trauma is classified as blunt force, sharp force, or projectile, and it can either be accidental or interpersonal. Trauma's categorization in the skeleton can encompass fractures, surgical intervention, and soft tissue trauma such as ossified hematomas (Buikstra and Ubelaker 1994). Trauma was reported as designated by the monograph authors (see Brickley, Miles, and Stainer 1999; Cowie, Bekvalac, and Kausmally 2008; Emery and Wooldridge 2011). Fractures and soft tissue trauma are combined initially in the trauma section of the St. Pancras monograph. As such, the same was done for the other samples for the purposes of the analysis of trauma data. Fractures were then discussed separately for St. Pancras and included both accidental and interpersonal trauma, so again, the analysis treated the other samples similarly.

Statistics

Skeletal data from the St. Pancras Burial Ground, Crossbones Burial Ground, and Chelsea Old Church Cemetery were accessed through The Museum of London's Wellcome Osteological Research Database as well as the monographs published for each sample. The St. Pancras sample is the primary focus of analysis. Its large sample size of 224 females and its thoroughly documented high-status portion gave an opportunity to test hypotheses with appropriate statistical power. This robust sample is compared to two known status cemeteries: Crossbones and Chelsea Old Church. The adult portion of the Crossbones and Chelsea Old Church samples contained 27 and 74 females, respectively.

Each pathology was considered separately in this analysis because independence could not be confirmed. SPSS was used to run Pearson Chi-square tests comparing the frequencies of the aforementioned pathologies to determine the level of association between cemetery-based status and the measured pathologies. Fisher's exact was used when expected counts were below 5.

CHAPTER IV: RESULTS

In this section, the frequencies of pathologies across the samples and the results of the Chi-square analysis are presented. Frequencies of each pathology tested in the samples can be observed in Table 4.1, and those differences are visually demonstrated in Figure 4.1. The p-values that were calculated in the Pearson Chi-square test are given in Table 4.2.

Table 4.1 Frequencies of the presence of each pathology in the burial samples. (Abbreviations: PD= Periodontal Disease, LEH= Linear Enamel Hypoplasias, PL= Periapical Lesions, TB= Tuberculosis, Trep.= treponematosis)

	St. Pancras			Crossbones			Chelsea Old Church		
Pathology	Sample Size	Presence (n)	%	Sample Size	Presence (n)	%	Sample Size	Presence (n)	%
Caries	146	89	60.96	25	22	88	41	29	70.73
Calculus	146	118	80.82	25	23	92	41	39	95.12
PD	149	63	42.28	25	24	96	40	39	67.5
LEH	146	118	80.82	25	18	72	41	39	56.1
PL	149	13	8.72	25	10	40	45	39	31.11
TB	224	4	1.79	27	0	0	74	1	1.35
Trep.	224	5	2.23	27	2	7.41	74	1	1.35
Rickets	224	10	4.46	27	2	7.41	74	5	6.76
Trauma	224	26	11.61	27	10	37.04	74	15	20.27
Fractures	224	20	8.93	27	4	14.81	74	8	10.81

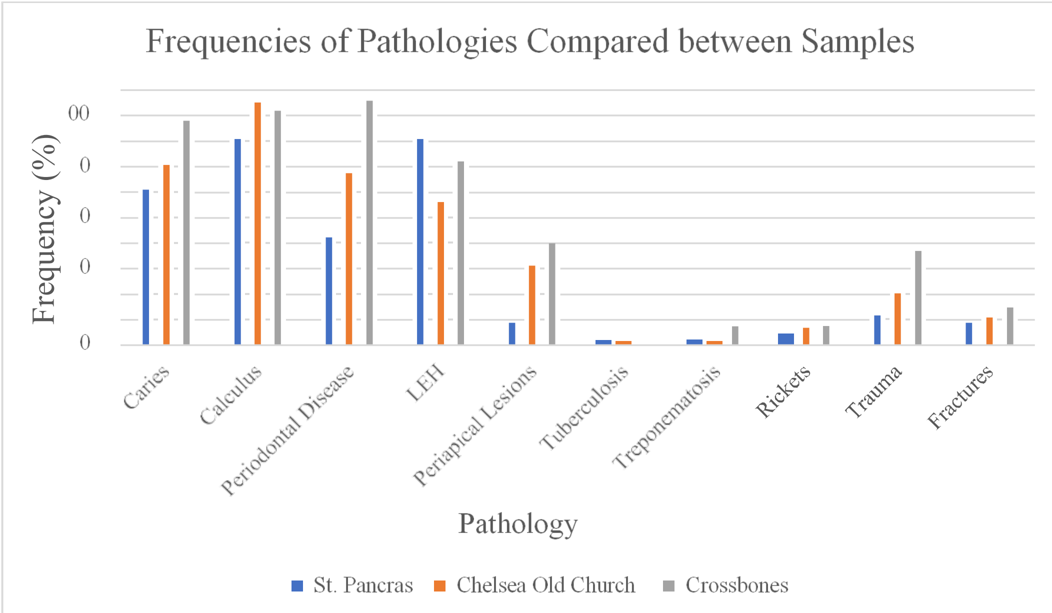

Figure 4.1 Bar chart displaying the differences in pathological frequencies between samples.

Table 4.2 P-values for tested pathologies. P-values in red indicate statistically different pathological frequencies between those samples. (Abbreviations: PD=Periodontal disease, PL=Periapical lesions , TB=Tuberculosis, Trep.=Treponematosis)

	Caries	Caculus	PD	LEH	PL
CB/CC	0.104	0.606	0.007	0.196	0.453
SP/CB	0.009	0.256	<0.001	0.312	<0.001
SP/CC	0.252	0.027	0.007	0.001	<0.001
	TB	**Trep.**	**Rickets**	**Trauma**	**Fractures**
CB/CC	1	0.173	1	0.084	0.729
SP/CB	1	0.167	0.624	0.002	0.305
SP/CC	1	1	0.539	0.079	0.648

Dental Pathology

Dental Caries

Dental caries were present in the majority of each sample– 60.96% in St Pancras (n=89), 88% in Crossbones (n=22), and 70.73% in Chelsea Old Church (n= 29). The differences in these frequencies were only significant between St. Pancras and Crossbones (p=0.009). The odds of dental caries were 4.697 times more likely in the Crossbones sample than in the St. Pancras sample ($x(1)=6.853$, $p=0.009$). The difference in caries was not significant between Chelsea Old Church and Crossbones (p=0.104) and between St. Pancras and Chelsea Old Church (p=0.252).

Dental Calculus

Dental calculus was present in 80.82% of the St. Pancras sample (n=118), 92% of the Crossbones sample (23), and 95.12% of the Chelsea Old Church sample (n=39). Again, only one comparison yielded significant results: St. Pancras and Chelsea Old Church. The odds of dental calculus were 4.627 times higher in the Chelsea Old Church sample than in the St. Pancras sample ($x(1)=4.86$, $p=0.027$). The difference in rates of dental calculus was not significant when Crossbones was compared to Chelsea Old Church and when compared to St. Pancras (p=0.606 and p=0.256). Fisher's exact was used for comparisons involving Crossbones.

Periodontal Disease

The rates of periodontal disease were 42.28% in St. Pancras (n=63), 96% in Crossbones (n=24), and 67.5% in Chelsea Old Church (n=27). Differences in periodontal disease were significant in all comparisons. The odds of periodontal disease were 11.494 times more likely in the Crossbones sample than in the Chelsea Old Church sample

($x(1)=7.394$, $p=0.007$), 31.238 times more likely in the Crossbones sample than in the St. Pancras sample ($x(1)=23.569$, $p<0.001$), and 2.703 times more likely in the Chelsea Old Church sample than in the St. Pancras sample ($x(1)=7.260$, $p=0.007$).

Linear Enamel Hypoplasias

Linear enamel hypoplasias were present in 80.82% of the St. Pancras sample (n=118), 72% of the Crossbones sample (n=18), and 56.1% of the Chelsea Old Church Sample (n=23). The difference in LEH frequencies was only significant between St. Pancras and Chelsea Old Church, in which the odds of LEH were 3 times more likely in the St. Pancras sample than in the Chelsea Old Church sample ($x(1)=0.55$, $p=0.001$). Rates of LEH were not significantly different when Crossbones was compared to Chelsea Old Church ($p=0.196$) and to St. Pancras ($p=0.312$).

Periapical Lesions

Periapical lesions occurred in 8.72% of the St. Pancras sample (n=13), 40% of the Crossbones sample (n=10), and 31.11% of the Chelsea Old Church sample (n=14). The frequencies of periapical lesions were significantly different in comparisons involving St. Pancras. The odds of periapical lesions were 6.974 times more likely in the Crossbones sample than in the St. Pancras sample ($x(1)=18.255$, $p<0.001$) and 4.725 times more likely in the Chelsea Old Church sample than in the St. Pancras sample ($x(1)=14.457$, $p<0.001$). A Fisher’s exact test was used in the comparison between St. Pancras and Crossbones. The only difference that was not significant for periapical lesions was between Crossbones and Chelsea Old Church ($p=0.453$).

Infectious Diseases and Rickets

<u>Infectious Disease</u>

Tuberculosis was present in 1.78% of the St. Pancras sample (n=4) and 1.351% of the Chelsea Old Church sample (n=1). There were no instances of identifiable tuberculosis in the Crossbones sample. Differences in tuberculosis frequencies were not significant across all comparisons, with a p-value of 1 for all (p=1). Fisher's exact was used for comparisons involving Crossbones.

The second infectious disease examined, treponematosis, was present in 2.232% of the St. Pancras sample (n=5), 7.7% of the Crossbones sample, and 1.351% of the Chelsea Old Church sample (n=1). Like tuberculosis, differences in treponematosis frequencies were not statistically significant between Crossbones and Chelsea Old Church (p=0.173), St. Pancras and Crossbones (p=0.167), and St. Pancras and Chelsea Old Church (p=1). Fisher's exact was used for comparisons involving Crossbones.

<u>Rickets</u>

The frequency of rickets was 4.464% in St. Pancras (n=10), 7.407% in Crossbones(n=2), and 6.757% in Chelsea Old Church (n=5). Comparisons using these pathological frequencies were not significant for Crossbones and Chelsea Old Church (p=1), St. Pancras and Crossbones (p=0.624), and St. Pancras and Chelsea Old Church (p=0.539). Fisher's exact was used for comparisons involving Crossbones.

Trauma

<u>Trauma</u>

Overall, trauma frequencies were 11.607% in St. Pancras (n=26), 37.037% in Crossbones (n=10), and 20.27% in Chelsea Old Church (n=15). The only significant difference in frequencies was between Crossbones and St. Pancras. The odds of trauma were 4.48 times more likely in the Crossbones sample than if they were from the St. Pancras sample (x(1)=12.683 , p=0.002). Trauma frequency differences were not significant in the comparisons between Crossbones and Chelsea Old Church (p=0.084) and between St. Pancras and Chelsea Old Church (p=0.079). Fisher's exact was used for comparisons involving Crossbones.

Fractures

Frequencies of fractures were considered both separately and in the overall trauma analysis. Fractures were present in 8.929% of the St. Pancras sample (n=20), 14.815% of the Crossbones sample (n=4), and 10.81% of the Chelsea Old Church sample (n=8). Differences in fracture frequencies were not significant for all comparisons: Crossbones and Chelsea Old Church (p=0.729), St. Pancras and Crossbones (p=0.305), and St. Pancras and Chelsea Old Church (p=0.648). Fisher's exact was used for comparisons involving Crossbones.

CHAPTER V: DISCUSSION AND CONCLUSION

In this chapter, a review and further discussion of the results will be conducted by interpreting them in their historical contexts. St. Pancras exhibits lower frequencies of most pathologies, which is something that might be expected for a higher status sample, with one significant exception: linear enamel hypoplasias. The hypothesis that the status of St. Pancras would fall in between that of Crossbones and Chelsea Old Church was not supported, likely due to the unique burial composition of St. Pancras. Some limitations and future directions and a conclusion of the findings will be presented.

Discussion

While the Crossbones and Chelsea Old Church samples represented very different social statuses in industrial London, they were actually more statistically similar to each other than either was to St. Pancras. Only the rates of periodontal disease significantly differed between Crossbones and Chelsea Old Church ($p=0.007$). However, comparisons of Crossbones and St. Pancras yielded 4 significant differences, as did the comparisons between Chelsea Old Church and St. Pancras. Dental caries ($p=0.009$), periodontal disease ($p<0.001$), periapical lesions ($p<0.001$), and trauma ($p=0.002$) were significantly different when St. Pancras and Crossbones were compared, and dental calculus ($p=0.027$), periodontal disease ($p=0.007$), linear enamel hypoplasias ($p=0.001$), and porotic lesions ($p<0.001$) were significantly different when Chelsea Old Church was compared to St. Pancras.

St. Pancras's health profile does not seem to fall in between the high-status and low-status samples as was hypothesized, but instead demonstrates lower frequencies of pathological indicators for eight of the nine significant indicators: caries (SP=60.96%, CB=88%), calculus (SP=80.82%,CC=95.12), periodontal disease (SP=42.28%, CB=96%, CC=67.5%), periapical lesions (SP=8.72%, CB=40%, CC=31.11%), and trauma (SP= 11.61%, CB=37.04%) However there was an exception: linear enamel hypoplasias (SP=80.82%, CC=56.1%). The frequency of this pathology in the St. Pancras sample was significantly higher than in the other samples– this will be discussed later.

St. Pancras possibly had some unique features that at least partially buffered it from the issues facing industrial period women from the other samples. One unique feature could lie within "Catholic Pancras", which is the term used to refer to the Third Ground of St. Pancras's cemetery and the large quantity of Catholic burials located there. This was of note because London was seemingly an anti-Catholic city. The only instance in which St. Pancras had a higher rate of pathology was linear enamel hypoplasia, which is an early life indicator of stress– particularly nutritional stress. Parishioners that immigrated due to the strife surrounding the French Revolution likely experienced childhood in a stratified society with active social upheaval. There were limitations on food and housing (Carpenter 1999). This could leave them vulnerable to stress, and the responses particularly triggered by nutritional stress could inhibit the development of secondary dentition of individuals. Something that could help further contextualize this is understanding who in this sample has linear enamel hypoplasias. It could either be that even the wealthy French migrants were not buffered earlier in life, or that the migrants who were originally lower class in France were particularly vulnerable to early life nutritional stress. Historical knowledge would indicate the latter, but further research is needed to confirm this. In contrast, the later life indicators show a divergence from the initial trajectory of their dental health. This could be an osteological paradox issue (see Wood et al. 1992 for discussion on the osteological paradox), meaning that the high levels of LEH could be a case of healthy individuals surviving stress.

Despite the poor émigrés populating the surrounding parish, wealthier émigrés from across the Thames were noted to have been regularly buried there due to its significance. Even though the third ground was the poorest section of the burial ground, this still held true. The addition of multiple high-status individuals to the sample could explain why St. Pancras appears more similar to a higher status sample than Crossbones despite being a relatively poor area.

The composition of the Chelsea Old Church sample could be the source of its comparatively higher rate of pathologies than what was observed in the St. Pancras sample. While Chelsea Old Church cemetery was generally considered a high-status cemetery, it was open to anyone, and many middle and low-status individuals were buried there as well. This would likely raise the rate of pathology presence in the sample.

This more-middling status of Chelsea Old Church trends can be supported by Mathena-Allen and Zuckerman (2020). In their analysis of multiple burial samples from rural and urban industrial period Britain, which included samples from London, they found that Chelsea Old Church had a higher rate of oral stress indicators (LEH and caries) than other communities within London– excluding Crossbones, for which frequencies of oral stress indicators were not given (Brickley, Miles, and Stainer 1999).

Diet and Dentition

Dental health is central to this analysis. General trends can be seen in the overall frequency distributions, but the significant differences primarily lie in the comparisons between St. Pancras and the other samples.

The one disease that significantly varied between all three samples was periodontal disease. Periodontal disease was 25.22% more likely in Chelsea Old Church than in St. Pancras. This number increases to 53.72% more likely in Crossbones when compared to St. Pancras, which is greater than the 28.5% increase from Chelsea Old Church to Crossbones. This demonstrates an overall trend in pathological frequencies, setting up St. Pancras as the samples with the overall lowest pathological frequencies of the three samples based on the indicators used, with Chelsea Old Church and Crossbones following respectively.

The shifting purposes of workhouses in industrial London and its subsequent increase in the consumption of foodstuffs containing high levels of sugars like bread, potatoes, and beer by poor people likely caused and exacerbated these dental health issues. The portion of low-quality starchy foods and high-quality nutritiously diverse foods was proportional to one's status (Shields Wilford and Gowland 2019) and this can be seen in the comparisons of dental pathologies between these samples. The majority of St. Pancras parishioners likely had better access to nutritious foods than their counterparts in the other samples, especially Crossbones, who were relegated to a carbohydrate-dense and nutritiously hollow diet provided by the parish, though the poor of St. Pancras probably had diets equivalent to those of Crossbones (Carpenter 1999).

Trauma

While the industrial period did see an increase in industry related trauma– particularly fractures (Roberts and Cox 2003), there was no significant difference in fractures between cemetery samples, meaning having a higher status was not as much of a buffering effect against fractures. However, the overall frequencies of fractures was low, so this could be the result of the limited sample size. St. Pancras still had a lower frequency of fractures, and Crossbones had the highest rate of fractures. When trauma as a whole is considered, there was a significant difference between St. Pancras and Crossbones– this was not seen in the other comparisons. Females from the Crossbones sample were 4.48 times more likely to have evidence of trauma. Lower status women were more likely to work in factories; therefore, this could be attributed to the types of industrial labor women did that lent them to more strain related injuries and ossified hematomas from soft tissue injury as well as instances of surgical intervention in the record.

Conclusion

Industrial London's stratification had tangible consequences on the lives of women. Lower status females tended to have higher rates of dental pathology than their high-status counterparts, likely from their starchy, limited-nutrition diet of bread, beer, and the like. Differences in fracture frequencies are not significant, so the difference in trauma frequencies between St. Pancras and Crossbones is likely due to surgical intervention and soft tissue trauma, one or both of which could be from a higher presence of females in industrial settings.

Particularly interesting was the importance of migration to the composition of the sample from St. Pancras and to the results. Despite the burial ground being located in a poor area, social pressures moved wealthy migrants to be buried in the same place as the poor migrants, making it difficult to determine which is affecting the frequencies more heavily. On top of that, LEHs were the only pathology for which St. Pancras had a significantly higher frequency within the sample than seen in Chelsea Old Church. This implies either: 1) that even the wealthy French migrants were not buffered earlier in life, or 2) that the migrants who were originally lower class in France were particularly vulnerable to early life nutritional stress. The latter seems more likely, but more research will be needed to determine that.

Going forward, the inclusion of more samples, particularly high-status samples, would be useful in order to see how St. Pancras compares to a variety of other samples and to further investigate the high frequencies of LEHs. It wasn't possible for this analysis, but in the future, access to more detailed records of the original skeletal analyses would be needed to see if there are other pathologies separated by sex, particularly pathologies like osteoarthritis and periosteal reactions.

Going back to the original hypothesis, it was anticipated that St. Pancras's pathological frequencies would fall somewhere between Crossbones and Chelsea. Instead, it was found that St. Pancras and its inhumated paupers, aristocrats, and migrants had generally lower frequencies of pathologies than the other two samples. Crossbones and Chelsea Old Church were actually more statistically similar to each other than either was to St. Pancras.

While St. Pancras cannot be used as a representative sample of females from the area immediately surrounding the cemetery due to its unique composition, it gives a glimpse into the complex interactions between the identities of sex, migration, and socioeconomic status, which can in turn help inform current work on these issues.

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