Tracing Life Histories Through Biological Manifestations in a 19th-20th Century Midwestern Poor Farm: Asymmetry, Robusticity, and Adaptive Response at the Milwaukee Poor Farm

Samantha Zahn-Hiepler
Minnesota State University, Mankato

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Tracing Life Histories through Biological Manifestations in a 19th-20th Century Midwestern Poor Farm: Asymmetry, Robusticity, and Adaptive Response at the Milwaukee Poor Farm

By

Samantha Zahn-Hiepler

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Science In Applied Anthropology

Minnesota State University, Mankato
Mankato, Minnesota
November 2019
Date:

*Tracing Life Histories through Biological Manifestations in a 19th-20th Century*  
*Midwestern Poor Farm: Asymmetry, Robusticity, and Adaptive Response at the*  
*Milwaukee Poor Farm*

Samantha Zahn-Hiepler

This thesis has been examined and approved by the following members of the student’s committee.

Kathleen Blue
Advisor

Kathryn Elliott
Committee Member

Lori Lahlum
Committee Member
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Samantha Zahn-Hiepler
ABSTRACT

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Samantha Zahn-Hiepler

Master of Science, Applied Anthropology

Minnesota State University, Mankato

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A life history is comprised of many elements and events: memories, migration, beliefs, wealth, status, health, and even death. Of these life history elements, health is one of the significant traits to trace in bioarcheological studies. Biological variation is an observable trait in skeletal remains, especially that of limb asymmetry, stature, robusticity, and sexual dimorphism. These characteristics, depending upon the extent seen, can provide an insight into sociocultural and environmental practices that may have affected the person and/or population’s quality of life. The Milwaukee County Poor Farm skeletal collection is comprised of a historical population spanning one hundred years and whose members share similar social and economic status, yet their life histories may vary in terms of ethnicity, migration patterns, cultural beliefs, and even cause of death. A regional comparison to three comparable case studies will be used to determine if populations with similar life histories demonstrate parallel biological characteristics and/or pathologies. With the analysis of specific metric and non-metric traits, in reference
to other published and historical works, sociocultural elements of historical populations may be traced.
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CHAPTER I: INTRODUCTION

Description of Project

Biological variation can be produced and manifested within the skeletal system in a variety of ways. In an individual’s life, the sociocultural and physical environment can create periods of stress—bones will respond in ways that reflect these patterns. Bone variation and/or development varies dependent upon extrinsic and intrinsic factors. Extrinsic factors include social status, diet, malnutrition, disease, occupation, or climate where intrinsic factors are related to genetics and hormones (Roberts and Cox 2003). Limb bone asymmetry, a bone tissue abnormality, is caused by these factors; depending upon the severity of the asymmetry, sociocultural elements can be elucidated (Kujanova et al 2008). In addition to bone limb asymmetry, other indicators of environmental and sociocultural stress can include stature, sexual dimorphism, and robusticity of a person and/or population. Over time, these traits can affect overall body size and shape as well as bone plasticity and health. Limb asymmetry, stature, sexual dimorphism and robusticity as noted in the skeletal system can provide a biological narrative in potential life histories of historical populations (Roberts and Manchester 1995; Spencer Larsen 1997; White and Folkens 2005; Kujanova et al 2008).

The Milwaukee County Poor Farm Collection is the main focus of this project. Publications by Strange, Milligan, and Richards (1997; 2010; 2016; 2017) situate the Milwaukee County Poor Farm Cemetery interments in one of three criteria: (1) those of lower socioeconomic status, (2) patients of the hospital and/or mental institution and/or (3) persons who were murdered, died via accident or suicide, or were without local kin.
These categories are linked to social, cultural, and economic status, as well as societal beliefs concerning how those interred in the Milwaukee County Poor Farm Cemetery should be treated prior to and following death. These three social criteria can be associated with other forms of cultural and physical/environmental experiences such as occupational hazards and diet which can create stress in the skeletal system. Long periods of intrinsic and/or extrinsic stress can contribute to limb asymmetry and robusticity whereas a population’s stature and degree of sexually dimorphic traits can be associated with resource acquisition, mechanical loading, and other forms of complex sociocultural factors and experiences (Kujanova et al 2008; Macintosh et al 2016).

The analysis of limb asymmetry, robusticity, stature, and sexual dimorphism, and other biological manifestations of the Milwaukee County Poor Farm skeletal collection can provide researchers with an insight into the life histories of this historical population. The metric and non-metric observations (i.e. osteometrics, pathology, body size) collected from the Milwaukee County Poor Farm remains will be utilized as the primary method of discerning the social and environmental influences the deceased experienced throughout their lifetime in corroboration with other academic research. In addition to this data, a cross-regional examination of other skeletal collections that fall into specific criteria will also be utilized. The Colorado State Asylum, the New York Albany County Almshouse, and the Cook County Poor House in Chicago, Illinois are the three case studies that will be referenced in comparison to the Milwaukee County Poor Farm as each location 1) utilized during the same time period, 2) served similar populations, and 3) has the focus of a previous archaeological project which then produced a skeletal collection for accessible anthropological research. With the combination of data
collection taken from the Milwaukee County Poor Farm skeletal remains and published research focused on similar populations, it can be determined if these comparable populations experienced analogous manifestations of socioeconomic and environmental stress as denoted by significantly similar degrees of limb asymmetry, robusticity, stature, sexual dimorphism, and other biological manifestations exhibited in the skeletal remains.

**Significance and Ethical Consideration**

This large skeletal collection originates from the Milwaukee Poor Farm Cemetery and is now under the care of the University of Wisconsin, Milwaukee. This historical population has been the basis for many research projects and has provided a foundational, as well as more individualized, understanding of the individuals comprising the Milwaukee County Poor Farm community as accounted by those interred in the cemetery. This project, “Tracing Life Histories through Biological Manifestations in a 19th-20th Century Midwestern Poor Farm: Asymmetry, Robusticity, and Adaptive Response at the Milwaukee Poor Farm,” provides a multifaceted perspective on midwestern historical populations, specifically those belonging to the lower sociocultural and economic classes of 19th and 20th century American-western society. This project will provide additional understandings of how sociocultural conditions play a role in health, and in turn, how the effects of these conditions can be biologically manifested. Due to the differing social, cultural, economic, and ethnic backgrounds of the Milwaukee County Poor Farm Cemetery remains, as well as sheer number of remains collected as a result of the archaeological survey, the population represents a range of biological variation that can be assessed as to its proximate causes. This master’s thesis emphasizes the use of osteometrics and anthroposcopic observation in combination with published research
which may be of interest to those studying bioarcheology, osteology, paleopathology, and American Midwest history.

Although the Milwaukee County Poor Farm skeletal collection has yielded a wealth of information concerning historical Midwestern populations it is imperative that researchers, such as myself, conduct research in an ethical fashion. The lead archaeologists of the 1991 and 2013 archaeological excavations and representatives of the University of Wisconsin, Milwaukee were active consultants throughout data collection pertaining to this research. The partnership established between lead archaeologists and the author ensured that proper lab protocols and procedures were practiced in the data collection and consultation process. Out of respect for the deceased individuals, photos were only taken with the permission granted of the University of Wisconsin, Milwaukee’s Archaeology Lab’s faculty and will only be used as reference guides throughout this master’s thesis. Furthermore, AAPA Guidelines focusing on the treatment and respect of skeletal remains were actively practiced when analyzing those interred in the Milwaukee County Poor Farm Cemetery (2003).

In order to address the multiple avenues of this project, there are several overarching theories, topics, and alternating historical narratives that must be acknowledged. The layout of this thesis allows for a thorough examination of these elements: Chapter 2: Terms, Definitions, and the Complexity of Health and Culture provides an explanation of recurring and important terms that will be referenced throughout the thesis. In addition, the term “health” will be explored in cross-cultural and cross-scientific perspectives. Chapter 3 focuses primarily on theoretical frameworks of osteology, archaeology, and mortuary studies. Chapter 4: Background and History will
provide a detailed overview of 19th century Milwaukee, the Milwaukee County Poor Farm, as well as the regional comparisons. Chapters 5 and 6 (Materials/Methods and Results) will be followed by the Discussion chapter that will focus on an in-depth analysis of the Milwaukee County Poor Farm results in conjunction with data from the regional comparisons. The penultimate chapter of this thesis is titled Limitations in which will be addressed issues and/or bias that was experienced throughout the project’s process. A concluding chapter will delineate a summary of my findings.
CHAPTER II: TERMS, DEFINITIONS AND THE COMPLEXITY TO HEALTH CULTURE

Terms and Definitions

Throughout this thesis, there will be several recurring and important terms that will be referenced which span multiple disciplines of study. Although this project’s primary case studies are focused on historical archaeological remains, a significant amount of research in osteology, health and culture, and relevant historical data were accessed in order to provide an overarching narrative of the historical population. This chapter will focus on presenting these terms and concepts with their corresponding definitions and/or relevance in current research.

Osteology

Osteology is the study of bones, both human and non-human, which are the “strongest biological materials in existence” (White and Folkens 2005: 33). The skeletal system is the primary supporting structure of the body and is composed of two compound materials: collagen, a protein which forms into elastic and flexible fibers in the bone, whereas the other compound, hydroxyapatite, provides stiffness within the bone. These two materials combined allow for the strength and rigidity of the skeletal structure, as well as its flexibility and plasticity. The skeleton’s morphology, which is comprised of the size and shape of the skeletal elements (i.e. each individual bone) can alter over time in response to trauma and disease and is also affected by other forms of biological variation (i.e. genetic or environmental). There are many ways that biological is expressed in the skeletal system. The manifestations of biological variation in the skeletal system allow researchers to examine how intrinsic and extrinsic factors can affect the
morphology and plasticity of human bones (Roberts and Charlotte 1995; White and Folkens 2005).

Throughout this project, there are four forms of biological variation that are discussed heavily: limb asymmetry, stature, sexual dimorphism, and robusticity. *Limb asymmetry* is the degree of length differences between the limb bones; for example, the length of the right femur versus the length of the left. There are two forms of limb asymmetry that are commonly referenced in anthropological research: fluctuating and directional asymmetry. Fluctuating asymmetry is tied to random extrinsic instabilities or ‘developmental instabilities’ that may reflect a population’s ability or inability to adapt to environmental stresses (Mays 2002; Waidhofer and Kirchengast 2015; Graham and Ozner 2016). Directional asymmetry is when skeletal elements demonstrate a bias, such as a greater amount of stress applied to one side of the body, which in turn, manifests as observable and/or measurable differences between the skeletal elements; for example, hand bias (being right-handed over left) is often associated with directional asymmetry (Mays 2002; Waidhofer and Kirchengast 2015). The degree of limb bone asymmetry can provide details pertaining to possible occupational and environmental stress, as well as disease that a person may have experienced throughout their lifetime (Mays 2002; Kujanova et al. 2008; Waidhofer and Kirchengast 2015; Graham and Ozner 2016).

The height of an individual is called *stature*. In anthropological research, stature in skeletal remains is often associated with health—individuals with a reduced or smaller stature compared to the average of that area and/or population may have experienced poor health and diet throughout their lifetime. Contrary to this, individuals who have above-average stature may indicate higher social status due to the greater degree of
access to resources; this often correlates with the good health their status provides. Aside from stress and health, other factors such as genetics and environment can play a role in stature across populations (Roberts and Charlotte 1995; Spencer Larsen 1997). *Sexual dimorphism* is a difference in size and robusticity between males and females; for example, a common sexually dimorphic trait noted in the archaeological record is that males are typically larger than females. If there are significant differences between males and females of a specific population, the sexual dimorphic traits may provide cultural context such as gender bias in occupation (White and Folkens 2005; Pomeroy and Zakrzewski 2009). The final form of biological variation that will be discussed is *robusticity*, which is the strength and inflexibility of the skeletal element(s). Robusticity can be manifested through an increase of bone density and in the associated muscle markers, especially along limb bones. Robusticity can also reflect environmental and occupational stress that the person and/or population experienced throughout their lifetime (Hogue and Dongarra 2002; Imber and Aiello 2003; Pomeroy and Zakrzewski 2009).

*Archaeology*

Archaeological fieldwork versus research differs in terms of location, focus of study and of course, language. In addition, some terms and definitions may vary over time and settings. It is important to understand the terms that are consistently used throughout a specific study and how they pertain to that study’s particular research objectives and focus. There are four terms that will be discussed in this section: primary burial, secondary burial, taphonomy, and material culture. Although these four phrases are associated with archaeological research, they will be referenced in regard to their use
in osteological literature as the Milwaukee Poor Farm survey excavated primarily biological remains.

According to Richards, a primary burial is when either single or multiple individuals are interred in one location, such as a coffin (1997). A secondary burial is “defined as skeletal elements of one or more individuals placed inside the coffin or recovered from outside the coffin. Secondary burials probably represent autopsies of amputations when found inside the coffin of a primary burial” (Richards 1997: 40). As the Milwaukee Poor Farm transitioned into a medical facility, autopsies and dissections of the dead were not uncommon—during that period, sometimes the disposal of the dead and/or amputated body shared a grave. It was not uncommon to find secondary burials with not only biological remains, but medical waste was also interred at the same time; this was also recovered from the excavation (Richards 1997). When recovering skeletal remains, taphonomy can play a crucial role in the preservation of the survey’s findings, especially if it is biological. Taphonomy refers to the processes that take place that may alter the preservation of skeletal remains; for example, animal activity and climate will physically affect bones (White and Folkens 2005). Finally, material culture encompasses the physical objects that are recovered during an excavation that may symbolize aspects of a person and/or population’s sociocultural beliefs, status, and even treatment of the dead (Richards 1991; Spencer Larsen 1997; Richards 2016). Material culture retrieved from the Milwaukee County Poor Farm burials includes clothing, buttons, shoes, and adornments such as rings (Richards 1997; Richards 2016).
An Introduction of Health, Culture, and Environment

The definition of ‘health’ varies across cultures and fields of study and is also dependent on the time period and cultural context. For example, the understanding of health has shifted dramatically since the 19th century, alongside the development and progress of medicine, genetics, and germ theory. Health does not have one single explanation, although it does include a variety of overarching elements such as illness, disease, healing approaches, and/or susceptibility (McElroy and Townsend 2015). In 1946, the World Health Organization attempted to create a collective definition of ‘health,’ which was described as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (Coolidge 2015: 9). This explanation has since been discredited since the standards of the World Health Organization are unfeasible and simply improbable (Coolidge 2015). Disciplines such as cultural anthropology and medical anthropology largely agree that health is intertwined with complex sociocultural elements aside from the physical and psychological features of health and well-being (McElroy and Townsend 2015).

There have been three epidemiological transitions in disease emergence and human health (Armelagos et al 2005). The first epidemiological change took place 10,000 years ago alongside the presence of agriculture and large settlements. With the increase of sedentism, farming, and animal domestication there was also an increase in parasitic infectious diseases, such as anthrax and tuberculosis. As populations were beginning to manipulate their environment for agricultural and subsistence purposes, other bacterial and viral diseases that thrived within human hosts and/or environments became prevalent.

The second epidemiological transition took place as urbanization, globalization, and
industrialization developed universally. Between the 16\textsuperscript{th}-18\textsuperscript{th} centuries, cross-continental trade and expansion resulted not only in social and market networks but increased disease transmission. Sexually transmitted diseases and severe epidemics devastated populations. Following the introduction of industrialization in the 19\textsuperscript{th} century researchers see a decrease in infectious diseases due to the development of immunizations, but an increase of chronic and degenerative diseases. However, due to considerable social inequalities there is a consistent pattern which should be noted: those who are of lower socioeconomic status may not have access to immunizations and/or also live in less adequate housing with closer proximity to other people, which results in increased exposure to infectious diseases. In contrast, those who belong to a higher socioeconomic class who have access to immunizations and adequate housing are less susceptible to severe infectious diseases. On the other hand, those who benefit from lower susceptibility to infectious disease as a result of higher status tend to have a higher chance of being affected by chronic diseases. The third and final epidemiological transition is a current event—the human population is experiencing a resurgence of infectious diseases due to increasing habitat decimation, climate change, as well as social and economic inequalities within societies (Armelagos et al 2005).

These three periods of disease emergence are significant in health-related studies, especially in anthropological research. Health, disease, and environment are clearly tied to sociocultural behavior and practices. In order to study historic biological remains, it is necessary to understand the complex relationship between human behavior and experiences, and how that can manifest in the skeletal system. Moreover, every individual encounters stress throughout their lifetime and the \textit{kind} of stress may vary
dependent upon the person’s social status, occupation, subsistence methods, cultural practices, and/or environment (Manchester and Roberts 1995; McElroy and Townsend 2015). For example: heavy loading and stress on the body, which may be associated with occupation and social status, can influence the amount of \textit{robusticity} and \textit{limb asymmetry} in the skeletal structure of an individual (Hogue and Dongarra 2002; Mays 2002; Imber 2003; Kujanova et al. 2008; Pomeroy and Zakrewski 2009; Waidhofer and Kirchengast 2015; Graham and Ozner 2016) Social status, which can determine one’s access to important resources such as those associated with an adequate diet can, in turn, affect a person’s size or \textit{stature} (Roberts and Manchester 1995; Spencer Larsen 1997). Also, depending upon a person’s cultural background, gender bias may affect divisions of labor and/or occupation which then further influences size ratio or \textit{sexual dimorphism} between males and females (White and Folkens 2005; Pomeroy and Zakrzewski 2009). After examining the results of my analysis of the Milwaukee County Poor Farm skeletal remains, these sociocultural elements can possibly be elucidated, especially with cross-referencing other human skeletal collections and academic research. The relationship of health and culture will be assessed further in the \textit{Discussion} section in comparison to the Milwaukee Poor Farm remains analyzed in this study.
The study of bioarchaeology has progressed significantly within the last fifty years and continues to be redefined with the incorporation of other disciplines, such as mortuary studies and health and culture. As bioarchaeology is contemporarily acknowledged as a science of multiple disciplines, current research is increasingly holistic. However, most fields of study have a theoretical framework that does shape methodological and analytical approaches of that specific discipline (Klaus 2014). This chapter will outline theories in osteology, archaeology, and mortuary studies applicable to bioarchaeology and relevant to the research present within this thesis—as will become evident, many of these theories coincide with one another throughout this study. In order to demonstrate the complexity of bioarchaeological research, it is necessary to address specific principal theories underlying the research present within this study.

**Archaeological and Mortuary Theory**

There are many avenues of study within archaeology and mortuary research, especially since these fields are becoming increasingly holistic and interdisciplinary. Mortuary research is not only limited to burial preparation and practices, but sociocultural elements noted in burial recovery that may indicate religious or cultural beliefs of the deceased. In addition, archaeological research is also not restricted to the recovery of biological remains and material culture but is interested in how it can be representative of past populations. As archaeological and mortuary studies share similar theoretical backgrounds, they will be discussed concurrently (Parker Pearson 1999; Raktia and Buikstra 2008).
In the late twentieth century, archaeological and mortuary theory shifted in response to recognition of long-standing issues such as generalization and lack of cross-cultural examination, as well as in the methods applied by professionals within both disciplines to address the issues. Parker Pearson states that by studying funerary and mortuary practices, the “search for invariant relationships between the static remains of the archaeological record and the dynamic behaviors of the people of the past” can provide reliable inferences of historic populations (1999: 27). This approach was termed New Archaeology, also referred to as processual archaeology in current literature—in terms of mortuary studies, this theoretical framework has explored concepts such as mortuary variability and energy expenditure in death practices. Lewis Binford, a founder of the processual archaeology movement suggested that 1) there is an association between the social status of the deceased and how many people the decedent had a relationship with during their lifetime and 2) the identity of the deceased will influence the mortuary rituals of the decedent. The identity of an individual is composed of several cultural facets such as social status, occupation, religious affiliation, ethnicity, age, and gender (Parker Pearson 1999; Charles 2008). All of these factors can influence mortuary ritual, and as Parker Pearson states “who you are affects how you get buried and the separate bits that make up your identity get represented in different ways” (1999: 29).

Parker Pearson’s statement can be applied to Joseph Tainter’s theory of energy expenditure in mortuary practices; for example, Tainter noted that social status and identity were tied to the complexity of funerary rituals, such as “body treatment, construction and placement of the interment facility…the extent and duration of mortuary ritual, [and] material contributions to the ritual” (Parker Pearson 1999: 31). Similar to Binford, Tainter noted that the decedent’s social rank and/or status would influence the
way in which a person would be treated and represented in death. However, even though these theories have been acknowledged in archaeological and mortuary fieldwork, processual archaeology has been criticized for continuing to generalize human behavior, focusing primarily on *what* the funerary rituals are instead of *why* people participated in this specific behavior (Parker Pearson 1999; Charles 2008).

In response to critiques concerning processual archaeology, subsequent archaeological practice and theory began to incorporate social elements, such as the role of agency and power in mortuary rituals. The integration of social theory and the post-processual movement in archaeological and mortuary studies emphasized individualization and agency in death. *Agency*, which encompasses the intentions behind particular actions or what people purposely do, can be analyzed in the archaeological record, particularly when studying monumentality, which is the practice of creating monuments to memorialize the dead (Parker Pearson 1999; Cannon 2008). Erecting monuments is a perennial method of demonstrating power, as well as solidifying cultural beliefs. Furthermore, in the case of death rituals and practices the utilization of monuments can be a way of solidifying one’s agency. Authenticating beliefs or social identity may be accomplished through death rites and rituals, yet it should be noted that the agency of the preparers responsible for performing the death rites and rituals will also be present since the decedent plays no direct role in their own burial. Post-processual archaeology advocates that the motivations behind ritual actions be acknowledged alongside social reasoning and human behavior instead of creating a static representation of historic human populations (Parker Pearson 1999).
Osteological Theory

Much of the theoretical framework in the study of osteology focuses on three elements: 1) the physiological response of bone to its environment 2) how health plays a role in the adaptation of the skeletal system and 3) the osteological paradox, which will be provided additional explanation following this section (Ornter 1985; Roberts and Manchester 1995; White and Folkens 2005). These three emphases of osteological research are interdependent upon one another. For example, due to the complex interplay between biological remains and sociocultural and physical environments, physical manifestations present on the skeleton could elucidate trauma, health and disease adaptative responses to the environment, or even sociocultural behavior, such as occupation (Ortner 1985). A common theory that is referenced throughout osteological analysis is Wolff’s Law, which asserts “that the form of the bone being given, the bone elements place or displace themselves in the direction of the functional pressure and increase and decrease their mass to reflect the amount of functional pressure” (Blackburn and Knüsel 2006: 377). That is to say, if an individual is participating in repetitive actions (e.g. heavy lifting) over a long period of time, this stress can be manifested on the bone in forms such as robusticity and/or limb asymmetry (Roberts and Manchester 1995; Waidhofer and Kirchengast 2015).

Other elements may further affect bone growth and morphology such as environmental and climate. For example, Bergmann and Allen’s rules are two commonly referenced laws that focus on average or common body size and limb proportion in relation to climate and/or environmental conditions. Bergmann’s Rule states that individuals living in hot environments tend to be taller with narrow bodies, whereas those living in colder climates are typically shorter in stature and have wider bodies. Allen’s
Rule asserts that people living in warm climates have longer limbs while people inhabiting cold environments have comparatively shorter limbs. These physiological traits are advantageous and will promote the person and/or population’s fitness—for example, those who experience cold harsh climates are able to conserve heat due to their bodies being smaller and shorter. This is directly tied to the ratio of body mass to surface area. Body mass relative to surface area is high in individuals with short, stout bodies; this configuration acts to increase body temperature and decrease heat loss; the opposite is true in warm climates where it is adaptative to lower body mass relative to surface area, so as to disperse body heat more readily. These laws can clearly be exhibited in skeletal structure, in terms of stature and body size. While Allen and Bergmann’s rule may not directly apply to the Milwaukee Poor Farm remains, it is important to acknowledge that there are theoretical frameworks that encompass the complex relationship of environment and biological variation (Meyer et al 2011; Larsen 2016).

Osteologists and biological anthropologists are aware of the “Osteological Paradox” and must refer to this theoretical understanding throughout their research, especially in regard to health and how illness and disease can manifest in bones. For example, a lesion may be manifested in both hard and soft tissue and usually signifies disease, however, lesions also indicate that healing is taking place. Lesions noted on the skeleton can elucidate the person(s) health and susceptibility (Roberts and Manchester 1995). The Osteological Paradox states that “archeological skeletal series include: (1) individuals that never experienced stress and have none of the related skeletal lesions, (2) individuals that experienced moderate stress which lasted long enough to result in some skeletal lesions, and (3) individuals that suffered heavy stress resulting in death soon after the onset of the disease and which, may, therefore, have a few or no skeletal lesions”
The Osteological Paradox demonstrates the difficulty of aligning pathology with health status. For example, if a set of skeletal remains displays severe lesions, this provides a dual narrative of the individual’s health: although the individual’s bones demonstrate that they were experiencing some form of stress, they were healing, suggesting that the individual had a greater immunity. In turn, skeletal remains that display no lesions may indicate either the individual experienced little to no stress that would cause osteological pathologies, or conversely, that the individual’s immunity was lacking, and they succumbed to disease before it could be manifested in their skeletal structure. The Osteological Paradox is a significant theoretical foundation of biological scientific research since it demonstrates the difficulty of studying skeletal manifestations due to the complex relationship between health, culture, and disease, and how it can be represented in skeletal remains. As the Osteological Paradox is a reoccurring issue within bioarchaeology and osteology (Ortner 1985; Pinhasi 2013), it will be further discussed in the Limitations chapter.
CHAPTER IV: BACKGROUND AND HISTORY

Poor Houses/Farms, Almshouses, and Institutions

Throughout this project, it is important to recognize that many of the locations referenced served very specific populations such as those with lower socioeconomic status, people who were mentally and/or physically disabled, individuals who strayed from social norms of that period (i.e. unwed mothers and alcoholics) and were therefore labeled deviant, or people diagnosed with extreme illnesses. Those admitted to institutions, almshouses, and poor farms may have had differing life histories; however, it can be unquestionably stated that all of them faced suffering at the hands of illness, society, or as a result of other aspects of their personal and/or occupational life. To address these increasing issues of the late 19th and early 20th century, state or privately-funded facilities and housing were created to house and cure those afflicted by physical, mental, or social ailments (Richards 1997; Spencer-Wood 2001; Spencer-Wood and Baugher 2001; Richards 2016).

There are three types of housing that will be referenced throughout this thesis including 1) Poor houses or poor farms, 2) almshouses and 3) institutions or asylums. It is necessary to note not only how the types of housing were differentiated, but also the similarities they share. Poor houses or poor farms (these two terms are used interchangeably in current literature) were facilities that temporarily housed impoverished persons; during their stay, people were often provided with food and sleeping quarters at the cost of the public, however, they were often county or state-run—the Milwaukee County Poor Farm is an example of such a system (Richards 1997; Richards 2016;
Richards 2016; Strange 2017). An almshouse was similar to a Poor Farm in the sense that it served the poor, however, almshouses were often established by taxes levied from wealthy locals and religious institutions. In addition, almshouses would often require manual labor from the establishment’s paupers—the New York Albany County Almshouse was a model of this relief system (Spencer-Wood 2001). Lastly, institutions or asylums of the 19th centuries were created to, in effect, “care for the mentally ill, to rehabilitate juvenile delinquents, to educate the blind, deaf, and dumb, and eradicate ignorance” (Spencer-Wood and Baugher 2001: 8). These specialized institutions were often funded by the state and private donations. The approaches to treating the afflicted and the principles held by these institutions, however, mirrored those of social and religious reformers of that period—a model of a 19th-century institution is the Colorado State Asylum (Spencer-Wood and Baugher 2001). Although these housing types and affiliated organizations differed in terms of funding, partnerships, and services, the terms “Poor Farm,” “Almshouse” and “Institution” began to be used interchangeably, obfuscating their original meaning. These terms, despite their history, began to represent a specific group of people who were poor, ill or considered deviants of society (Spencer-Wood 2001; Spencer-Wood and Baugher 2001). For the sake of clarity, the four case studies addressed throughout this project will utilize the terminology predominantly seen in the literature related to each term respectively, even though each of these facilities changed their titles and policies during the time they were in existence in response to sociocultural, economic, and administrative influences.
Social Theories of the 19th and 20th Centuries

Social and medical institutions were created to aid those suffering physical and/or mental ailments, as well as those burdened by economic failure—yet many of these establishments were founded on dominant western discourses laden with social and religious ideologies pertaining to the treatment of the poor. As the United States experienced increased urbanization in response to industrialization and mass waves of immigration, there was a rise in poverty and mental health issues among those with lower socioeconomic standing (Watkins 2003). This social crisis became a primary concern of the socialites and elites of Western society, who were often wealthy as well as religious. Caring for the poor, in the perspective of affluent social reformers, became the responsibility of the wealthy since they had the financial means to do so—for example, many social reformers believed it was their Christian duty to provide funds to institutions such as asylums, almshouses, and poor farms (Spencer-Wood 2001; Spencer-Wood and Baugher 2001).

Even though social concerns regarding the poor/poverty were grounded in religion and community service, power dynamics between the wealthy and poor were simultaneously at play. The creation of the poor farms, almshouses, and institutions was systematic in separating the rich from the poor, the healthy from the disabled and cultural deviants (e.g. immigrants) from those who conformed to Western society. In a way, these establishments maintained the social order which was, in turn, reinforced by many popular sociocultural theories of the late 19th century (Watkins 2003). Social Darwinism is the belief that social, political, and economic standing play a role in the progress or fitness of societies and/or persons belonging to a specific social status. Other ideologies,
such as eugenics, colonialism, and imperialism are rooted in or stem from the theory of Social Darwinism, including elements of ethnocentrism and other racial, ethnic, religious, and culturally charged ideologies (Spencer-Wood 2001; Spencer-Wood and Baugher 2001).

A Brief History of Milwaukee, Wisconsin, the Milwaukee County Poor Farm and the Archaeological Surveys

*Milwaukee, Wisconsin*

Prior to European colonialism and occupation of North America, there were several Indigenous tribes that occupied the state, such as the Ojibwe and Menominee. Indigenous groups were present well before and after the legal establishment of the state (Bieder 1995). Wisconsin was granted statehood in 1848, and as noted, the land had been occupied for several generations prior by Indigenous peoples and European immigrants alike. By the early 19th century, immigrants, primarily from Europe, had already shifted towards the Midwest to occupy additional territory, and these large urban centers developed which then increased localized population. By the mid-1800s, Milwaukee, Wisconsin had shifted from a French-Canadian fur trading post to a bustling industrial and maritime setting—in addition, the open water surrounding the coast of Milwaukee made the city a hub for incoming European immigrants. In 1848, the city partook in their first demographic assessment of Milwaukee’s ethnic population: over 50% of the population were immigrants (i.e. German, Irish, British, Canadians, Swiss, Norwegian). Just two years after the demographic assessment, the immigrant population of Milwaukee had risen to nearly 70%. Due to the growing settler population and because Milwaukee was becoming a hub for a wide range of ethnic groups, many immigrants with shared ethnic backgrounds gravitated towards similar occupations and/or lived within the same
neighborhoods throughout the city in effort to maintain their cultural affiliations (Rippley 1985).

Although some immigrant groups were able to become relatively successful, many of the incoming settlers struggled financially. A majority of Milwaukee’s population of the 19th century worked in the growing industrial and manufacturing plants of the city. Between 1870 and 1910, Wisconsin experienced an economic boom that “overshadowed trade and commerce without replacing it, as a fundamental bulwark of the city’s economic structure,” due to the rise in manufacturing plants (Still 1948: 321). Milwaukee’s production primarily included meatpacking and tanning, flour milling, brewing, and metalworking and as the city’s economy began to rise, so did trade and occupational opportunities. While men were primarily located in agricultural, manufacturing, industrial, and business ownership settings, women worked in more localized and specialized sectors (i.e. laundresses, domestic services, clothing industries) up until the mid-1900s (Still 1948; Rippley 1985). Although there were many opportunities that resulted in employment, a great number of incoming immigrants who settled in Milwaukee were of lower-socioeconomic status and often experienced financial stress throughout their lifetime (Richards 2016).

Milwaukee County is essentially made up of “seven rural towns located around the urban core of the City of Milwaukee,” (Richards 2016: 9) and as a result the economic, social, and political structure of the city varied. As the population began to increase in Milwaukee, the rift between higher and lower socioeconomic classes widened, separating the social classes even further. In response to the growing poverty and associated issues, the city of Milwaukee began to institute a relief system in 1835 to
aid the local poor, such as providing shelter and food—especially if the individual(s) did not have local kin and/or affiliation with a religious institution to provide that care. In the mid-1850s, there was an increase in relief systems due to a cholera epidemic that affected the entire city, and additionally between 1850-1860 due to two economic recessions. To address this ongoing issue, the Milwaukee County Board decided that an indoor relief system would help solve many of the issues that the city was experiencing. The Milwaukee County Board believed that an indoor relief facility would provide care to those burdened with a lower socioeconomic status, the ill, and transients—and, by being relocated to a facility, it would remove the poor problem from the city (Richards 2016).

**Milwaukee County Poor Farm**

In 1852, Milwaukee drafted a law that allowed the city to purchase a plot of land on which to build a place of refuge for the poor, disabled, or ill. One-hundred and sixty acres were purchased in Wauwatosa (a small city west of Milwaukee) by the Milwaukee County Board—the land included crops, cattle, small barns, and a farmhouse that was utilized as the primary facility for the incoming residents. There were 24 paupers immediately admitted to the poor farm and by the mid-1850s, the number of patients increased to nearly 60. In 1860, a hospital was built on the property but over time the growing numbers of patients, as well as increasing specialization of medicine (i.e. medicinal, surgical, and psychological) necessitated a larger facility, which was built in 1868. Although the second hospital was larger, the staff and those admitted faced a variety of issues such as poor sanitation and overcrowding; in response to these problems, a physician of the hospital would consistently inform the Milwaukee County Board of the conditions, imploring the board to provide additional resources. It was not until 1880, after a fire destroyed the hospital that two new hospital buildings were constructed with
adequate space and additional staff with specialized training, were provided to more appropriately accommodate the growing patient population (Richards 1997; Florence 2002; Klingmon-Cole 2015; Richards 2016).

The two hospitals were separated based on diagnoses: one for the sick, and the other for the insane. Due to the constant influx of patients, the new hospital buildings soon faced the same situation of inadequate space, staff, and other resources; in short, the size of the institution was unable to accommodate the overwhelming number of incoming patients from both the community and other state institutions. In 1889, the Asylum for the Chronically Insane was built to separate short-term patients that had a chance at rehabilitation from those with more severe, lifelong disabilities who would become permanent residents of the institution. Additional construction and renovation of the Milwaukee County Poor Farm facilities followed consecutively: children’s facility for ages 5-16 (1882), Home for Dependent Children (1898) that provided both temporary and permanent housing and educational programs, and Almshouse expansion (1896) to house nearly 700 individuals. There were many additional changes following the beginning of the 20th century: Rehabilitation Hospital (1903), a laboratory (1905), the Muridale Sanitarium (1915) that was specifically used for isolating and treating persons with tuberculosis, a new County hospital that was built to accommodate the growing number of patients (1930), and lastly a large staff residence and school was built (1932). In 1970, the infirmary was destroyed, and it was replaced with a parking lot—this land would soon be occupied by the Milwaukee County Mental Health Complex (Richards 1997; Florence 2002; Klingmon-Cole 2015; Richards 2016). The Milwaukee County Poor Farm’s title changed several times to reflect the ongoing construction of the facility,
as well as altering ideologies and medical practices of the period. Provided below are the original facility titles and the corresponding name adjustment(s) if applicable (Richards 2016):

- **Alms and Pest House (1843) = County Almshouse/Poor Farm (1859) = County Infirmary (1917)**
- **Home for Dependent Children (1898) = County Home for Children (1917)**
- **County Insane Asylum (1880) = County Hospital for the Acute Insane (1889) = County Hospital for the Mentally Diseased (1917)**
- **Asylum for the Chronically Insane (1889) = Milwaukee County Asylum for Mental Disease (1917).**

**Cemeteries and Archaeological Surveys**

As the Milwaukee Poor Farm became responsible for the local poor and ill population, the county assigned an additional obligation: providing inexpensive burials for the dead. Those individuals who were buried on the property were assigned to specific categories based on whether they were: 1) patients or paupers of the Poor Farm, 2) victims of suicide, homicide, or accident and/or, 3) without local kin and /or 4) could not afford a burial. There are four cemeteries associated with the Milwaukee County Poor Farm: Cemetery 1 (ca. 1878-1882), Cemetery 2 (1882-1925), Cemetery 3 (1925-1974), and Cemetery 4 (unknown date). From burial registers and other records, it was determined that the Milwaukee County Poor Farm’s land was used as a burial ground for nearly 100 years and halted in the mid-1970s due to the county utilizing funeral home services. The Milwaukee County Poor Farm cemetery was shaped like the letter ‘L’ and its size was equivalent to nearly four acres. It was determined that in total, there are more than 10,000 people buried in the Milwaukee County Poor Farm’s grounds (Milligan 2010; Richards 2016).

In 1991, the construction of the Ambulatory Care Center disturbed the Milwaukee County Poor Farm cemetery. Almost immediately, construction was halted,
and an archaeological survey was conducted by a local cultural resource management organization. The portion of the graveyard that was excavated was Cemetery 2 and was comprised of seven ‘areas,’ that were based on a loose timeline, spatial relationship, and other relevant characteristics—over 1,000 burials were recovered from Cemetery 2. Area I is suspected to be one of the earliest portions of the cemetery and contains an infant burial ground or Babyland. Area II is the only portion of the excavated cemetery that could be assigned a timeline due to burial number tags being located. These tags were cross-referenced with a burial register and it was determined that area of the cemetery was in use between mid-summer of 1918 to 1922. Only a portion of Area III was excavated and it is believed have been used during the 1920s. Area IV is an additional, more recent infant cemetery that is enclosed by adult burials; Areas V and VI contain both adults and infants, whereas Area VII is comprised of a grouping of adult individuals between the two infant cemeteries (Areas IV and V). As noted, it was not possible to assign precise time periods to the cemetery areas during the excavation (Richards 1997).

A second excavation of the Milwaukee County Poor Farm cemetery took place in 2013. Since the first initial excavation, the Froedtert Hospital had purposely avoided construction to prevent disturbing the surrounding burial grounds, however, in 2012 the hospital formally requested to build a new Center for Advanced Care that would be located on a portion of the Milwaukee Poor Farm cemetery. After several legal proceedings and coordination with a state organization, the Wisconsin Archaeological Survey, it was decided that the Milwaukee County Poor Farm cemetery would be disturbed again in order to accommodate the Center for Advanced Care construction. Throughout the excavation, construction of the hospital was also taking place, which
presented additional difficulties such as privacy and a time constraint to complete the survey. During the excavation, over 800 individuals were recovered along with other faunal remains and cultural material (Richards 2016). Further analysis of the biological remains (specifically belonging to the 2013 excavation) will be discussed in more depth in the Results and Discussion chapters.

A map of the four identified cemeteries of the Milwaukee County Institution (Image 4.1 taken from Richards 2016)

A Brief History of the Regional Comparisons

New York Albany County Almshouse

As Albany, New York became the state capital, the city also became heavily populated due to immigration and increased economic opportunities. Due to Albany’s close proximity to an open port, the lumber and mill trade expanded significantly, as well
as local enterprises (i.e. metalworking, newspaper and book publishing, brewing, and meatpacking and/or processing). However, with the rapid growth of the population, hardships followed such as increasing social inequalities and the spread of infectious diseases. In 1826, the Albany Almshouse was constructed on 200 acres of property, which also contained a medical school, hospital, and cemetery. The almshouse was built to house the “elderly, prostitutes, alcoholics, the homeless, the insane, the disabled, and the mentally impaired,” all of whom belonged to a lower socioeconomic class (Luisgnan Lowe 2017: 316). Many of the individuals who entered the almshouse had experienced extreme stress throughout their lifetime, whether it was occupation, economic, and/or related to their social status or cultural affiliation. Those who were almshouse inmates were deemed ‘under-privileged,’ but were still expected to earn their keep (Solano 2006).

To offset the cost of hospital maintenance, the almshouse required that inmates partake in laborious chores to aid in the facilities’ upkeep. Even though the Albany Almshouse exploited its patients, many of the inmates were unable to partake in the facility upkeep due to limitations caused by their physical and/or mental conditions. However, a significant number of individuals who were admitted to the almshouse must have left prior to their death as a majority of the interments of the almshouse cemetery are individuals who could not be identified, could not afford to be buried, were foreign-born, and/or were cadavers of the neighboring medical school (Solano 2006). In the mid-1800s, medical schools could legally access the unclaimed dead that were housed at public organizations which included almshouses. In response to this, the Albany Medical School began to utilize the almshouse’s dead and/or unclaimed individuals as cadavers to practice dissection. Following the medical procedure, many of the cadavers were then
buried in the Albany Almshouse Cemetery. In due course, the cemetery was forgotten and was rediscovered in 1989—in that year an archaeological survey was conducted, followed by another survey in 2000. In total, nearly 1,500 individuals were exhumed and eventually reburied (Luisignan Lowe 2017).

*Cook County Poor House*

Chicago, Illinois has always struggled with social and economic inequalities, including the issue of homelessness. In the mid-19th century, the rising population of a once rural location became overwhelming and introduced a variety of issues such as the spread of infectious diseases, a rising poverty level, and other racially and/or socially charged issues between different cultural groups. The Chicago Cook County Poor House or the Dunning Poor House (circa 1851) became an institution that was intended to aid individuals who were considered the “most desperate people, or the poorest of the poor,” who were often foreign-born, mentally or physically disabled, ill, women, or the elderly (Bloom 2001: 255). Despite the city’s attempt to address the multitude of complex issues associated with its growing population and disparate social classes by building the Poor House, the facility gained a negative reputation and became part of local folklore: “for many generations of Chicago children, bad behavior came to a halt with a stern warning: ‘Be careful, or you’re going to Dunning’” (Duis 1998: 327). Many researchers must rely on these folklore narratives, as public records of Chicago Cook County Poor House are sparse (Grauer and McNamara 1995).

Although there are few written records of the Cook County Poor House, there are significant documented historical events that influenced the patients of the facility. For example, the location has undergone extensive development: the poor farm had been built
in 1851, followed by the almshouse in 1854, and then the asylum which was constructed in 1868. Despite these extensions the facility was cited in a report that reprimanded the organization for overcrowding, poor sanitation, and ill-treatment of the patients (Grauer and McNamara 1995). Demographics of the Cook County Poor House document that many of the patients were foreign-born (primarily European) males, yet the majority of those interred in the Cook County Poor House cemetery are female—several of the osteological remains exhibit dissection cuts, similar to the Albany Almshouse and Milwaukee Poor Farm, suggesting these individuals may have been similarly used as medical cadavers. There are no records that document the initial use of the cemetery; however, it is believed to have been used as early as 1869. In 1990, the cemetery was excavated with a recorded 114 individuals (Grauer et al 2017).

*Colorado State Asylum*

The Colorado State Asylum is located in Pueblo, Colorado and was established in 1877. In the early years of the asylum, the population of Colorado was rapidly expanding as the territory became heavily occupied by settlers who played a significant role in the expansion of railroad and mining enterprises. Immediately, social and economic disadvantages had devastating effects on immigrant populations, greatly challenging their ability to find work to provide for themselves and support their families. Social stigma played a significant role in the lives of foreign-born individuals; for example, Irish immigrants were viewed as “morally and culturally deficient and incapable of assimilation into the American population, a view that presumably made them more subject to be identified as ‘ill’ (Magennis and Lacy 2014: 254). These negative representations of specific ethnic groups were incorporated into rhetoric commonly
utilized by physicians, especially ones employed by the Colorado State Asylum. Demographics taken from patient admissions between 1877-1899 demonstrate that foreign-born individuals were at a higher risk of being admitted to the asylum and, in addition, men constituted a higher admittance rate than women (Magennis and Lacy 2014).

Many of these patients experienced a combination of social, economic, and occupational hardship throughout their lifetime—these experiences played a large role in why the patients were consigned to the Colorado State Asylum. Although the initial mission of the facility was to aid the mentally ill, the patients experienced additional hardships caused by overcrowding, inadequate staffing, and mandatory manual labor. In order to offset some cost of the hospital, many of the inmates were required to maintain the farm, orchards, and gardens, shoulder the domestic housework and even aid in the construction of new hospital buildings. The Colorado State Asylum was severely underfunded, which prompted the staff to utilize patients to maintain the facilities; prevalent social ideas such as Social Darwinism and negative perspectives regarding mental illness justified this treatment and allowed it to continue (Magennis and Lacy 2014; McGloin 2012). These attitudes are also represented in the Colorado State Asylum cemetery, which was excavated in 1992 and 2000—the cemetery was unmarked but was dated between 1879-1899. In total, over 150 individuals were excavated and were aged and/or sexed via osteological methods as burial records were non-existent (McGloin 2012).
CHAPTER V: MATERIALS AND METHODOLOGIES

In order to analyze limb asymmetry, stature, and other metric traits of the skeletal remains belonging to the Milwaukee County Poor Farm collection, quantitative methods were primarily utilized. Osteometric examination was used during the data collection process to determine any patterns (e.g. limb bone asymmetry) among the given population of the study. The osteometric analysis of the examined remains entailed the use of an osteometric board, sliding calipers, and a tape measure throughout data collection. Amid collaboration with the University of Wisconsin-Milwaukee’s Archaeological Research Laboratory, 50-100 individuals were the target sample size for this project. Applicable remains from the Milwaukee County Institutional Grounds Cemetery Collection with complete epiphyseal union and appropriate preservation were assessed. Concluding the data collection process skeletal remains of 88 individuals were the subjects of osteometric examination.

To determine limb asymmetry and stature, specific measurements of the long bones were taken: length (maximum and bicondylar), midshaft circumference, and width of proximal and distal condyles of right and left femora, tibiae, humeri, radii, and ulnae. Not all elements need be present for inclusion in the study, however, it is necessary that complimentary sets are present (i.e. left and right maximum length of femur). Although limb asymmetry is present in all human beings, deviations greater than 1% are often considered an anomaly and depending upon the severity, limb asymmetry can further be considered pathological. Limb bone asymmetry of individuals will be determined through the difference in limb bone lengths (Kujanova et al 2008). Directional asymmetry will be
estimated using an equation provided by Waidhofer and Kirchengast (2015). Body size and variation can be ascertained by assessing stature; for this project, a statistical formula provided by White and Folkens (2005) was employed with applicable remains from the Milwaukee County Poor Farm sample (see Appendix I). Robusticity was based on non-metric observations of characteristics associated with muscle attachment sites (e.g. linea aspera) that were assigned a number (0-3) based on the level of severity of expression (see Appendix II). Analysis of sexual dimorphism within the sample population was based on metric comparisons between male and female stature and body size. These methods are all standard and commonly practiced procedures in osteological investigations of biological variation in body size and limb asymmetry (Mays 2002; Kujanova et al. 2008). All of the data was imported and stored in a Microsoft Excel 2016 document (see Appendix III). Data collection took place in September and December of 2018, at the University of Wisconsin, Milwaukee’s Archaeological Research Laboratory. Following data collection, measurement error was calculated using a formula provided by White and Folkens (2005) (see Appendix IV).

In addition to quantitative techniques, qualitative methodologies were used to complete this research. During the 1991 and 2013 archaeological surveys of the Milwaukee County Poor Farm, the University of Wisconsin-Milwaukee’s archeological team created an extensive skeletal index of all remains and cultural artifacts. This index provides the accession number assigned to the remains, form of interment (single, commingled), degree of preservation, taphonomic damage if present, presence of any pathologies, as well as any other biological indicators (i.e. age, sex). These indices were used to cross-reference between the osteological metric and non-metric data collected
during the 2018 data collection and the findings of the archaeological survey of 1991 and 2013. Recent academic and published research (i.e. theses, skeletal indices, archaeological surveys) were accessed in order to accomplish a cross-regional comparison between three other skeletal collections and the Milwaukee County Institutional Grounds Cemetery Collection. The case studies had to reference populations that fell into three specific foci: 1) the skeletal remains needed to belong to a population that experienced comparable life histories, such as belonging to an almshouse or being of a lower socioeconomic background, 2) the populations must be of the same era as the Milwaukee County Poor Farm, and 3) the skeletal collection must have been recovered via an archaeological survey. The three case studies that will be referenced throughout this analysis are the Colorado State Asylum, New York Albany County Almshouse, and the Cook County Poor Farm as these populations fall into the three categories previously stated and prior research on these studies is easily accessible. Cross-referencing published research from these three populations in conjunction with the osteological data (i.e. metric, nonmetric, and physiological traits of the remains) procured from the Milwaukee County Institutional Grounds Cemetery Collection will elucidate the sociocultural, economic, and occupational factors that contributed to the biological variations manifest in the Milwaukee Poor Farm population.
CHAPTER VI: RESULTS

Sample Size and Demographic Comparisons

A sample size of 50-100 skeletal remains was projected to be the ideal sample needed to accomplish the objectives of this project. In total, 88 skeletons from the Milwaukee Poor Farm Collection (primarily those recovered from the 2013 excavation) were measured using osteometric methodologies and non-metric observation. In conjunction with data collection, demographic information pertaining to age and sex was assessed and recorded by the University of Wisconsin, Milwaukee’s Archaeological Lab following the excavation—while conducting research for this project, the skeletal indices were provided as an additional reference. Of the 88 skeletal individuals, there was a significant bias in both age and sex demographics of the survey—for example, 67 of the individuals were osteologically sexed as male, accounting for 80% of the sample in this project. The remaining 20% were documented as female or indeterminate. The ages of the individuals in this project were divided into four categories, and all of the remains were identified as adults: 20-35, 35-50, 50+ years, or indeterminate. Only one specimen was aged 19.1-21 years by prior assessment of dental development and other bone fusion. Further assessment notes that 48% of the sample size died between the ages of 35-50 years of age, 25% died over the age of 50, 15% died between the ages of 20-35, and the remaining 12% of the sample size were unable to be aged, however, they were classified as ‘adult’.
The sex distribution compared to age-at-death statistics demonstrates a consistent bias. As noted, an overwhelming number of the sample had been osteologically sexed as male, however, when compared to age-at-death, nearly half of male specimens died between the age of 35-50, followed by 50+ years of age (see Table 6.1 for an age-at-death representation of the sample size, in conjunction with sex distribution). Further assessment of the sex distribution of the age groups demonstrates that a majority of the females died between the ages of 35-50 years old, however, in comparison to males, there were significantly less females who died over the age of 50+. This substantial difference between male and females can be attributed to the small sample size, as well as overwhelming bias in the sex distribution of the biological specimens used in this project. Further analysis of the survey demographics will be completed in the Discussion chapter.

<table>
<thead>
<tr>
<th>Table 6.1</th>
<th>Sex Distribution of Age-at-Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>50+ years old</td>
<td>[Graph showing distribution]</td>
</tr>
<tr>
<td>35-50 years old</td>
<td>[Graph showing distribution]</td>
</tr>
<tr>
<td>20-35 years old</td>
<td>[Graph showing distribution]</td>
</tr>
<tr>
<td>Indeterminate Age</td>
<td>[Graph showing distribution]</td>
</tr>
</tbody>
</table>
**Limb Asymmetry**

In order to assess limb asymmetry in the Milwaukee County Poor Farm Skeletal Collection, the remains used in this study had to be well preserved—it was imperative that the articulation points of limb bones had little to no deterioration so as to not distort the limb length measurements. In total, 34 skeletons were used to address asymmetrical traits in the skeletal survey. As preservation varied throughout the entire skeletal survey, 19 individuals could be assessed for complete elemental asymmetry, meaning both right and left upper/lower limbs were present and were appropriately preserved. In addition, six individual’s complete lower limbs were assessed, and nine individual’s upper limbs were measured—breaking the sample down into these three categories allowed for a larger sample size than complete elemental asymmetry alone would have allowed and thus better encompasses the representation of directional asymmetry in the limb bones.

Of all the appendicular elements observed, the upper limbs proved to be the best preserved throughout the skeletal samples. The difference in limb lengths was determined by comparing the right and left limb lengths of each specimen. It is important to note that in this skeletal sample, there were only five females that could be used, as the majority of the female skeletons exhibited severe deterioration throughout their elements. The difference between upper limbs ranged from 0.1- 1 centimeters, while the difference between the lower limbs ranged from .06- 0.1 centimeters. The greater range between upper limbs is not surprising, as upper limb bones (especially the humerus) tend to demonstrate more asymmetry than the bones of the lower limb (Kujanova et al. 2008; Waidhofer and Kirchengast 2015).
In order to determine directional asymmetry of the upper and lower limbs of each individual, an equation provided by Waidhofer and Kirchengast (2015) was utilized. Directional asymmetry is when one element of a paired bone is favored over the other—this is the form of asymmetry that was focused on during the assessment of the skeletal sample (Mays 2002; Waidhofer and Kirchengast 2015). This equation presents the percentage difference between the two paired limbs where “positive values indicate right-biased asymmetries, while negative values indicate left-biased ones” (Waidhofer and Kirchengast 2015: 512). Directional asymmetry percentage ranges and averages are provided below in Table 6.2:

Table 6.2 Directional Asymmetry Percentage Ranges and Averages

<table>
<thead>
<tr>
<th>Directional Asymmetry Range</th>
<th>Directional Asymmetry Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humerus: 0-1.32 %</td>
<td>Humerus: .64%</td>
</tr>
<tr>
<td>Radius: 0-2.4 %</td>
<td>Radius: .98%</td>
</tr>
<tr>
<td>Femur: 0-1.62 %</td>
<td>Femur: .55%</td>
</tr>
<tr>
<td>Tibia: 0-2.9%</td>
<td>Tibia: .73%</td>
</tr>
</tbody>
</table>

Of the 34 skeletons, only six of the skeletal remains exhibited a left bias of the upper limbs. However, there was a greater left bias in the lower limbs—in total there were 17 individuals who demonstrated a left bias in their femur and tibia. Further examination of the skeletal sample demonstrated that 16 of the skeletal remains exceeded 1% in limb length differences, which may suggest that the greater degree of asymmetry could be pathological or representative of stress and/or forms of sociocultural or environmental instabilities (Kujanoava et al. 2008; Van Dongen and Gangestad 2011). Of the 19 individuals that had full elements, 12 exhibited a 1% deviation. Of those 12 samples, two individuals had more than one element that was greater than 1% deviation, while the remainder were only isolated instances. In addition, although the sex
distribution was unequal throughout this project, only two female skeletons exhibited several directional asymmetrical traits. Further analysis of limb asymmetry and its relevance in the Milwaukee County Poor Farm population will be addressed in the Discussion chapter.

Stature

Stature was determined by Trotter and Gleser’s estimation equation, provided by White and Folkens (2005). As the remains in this study were of European descent, two equations specifically for white females and white males were utilized. The right femur was utilized to determine stature as it was the best-preserved element noted throughout data collection and would provide a more encompassing representation of the skeletal survey. Individuals that exhibited pathological conditions that affected the morphology and length of the bone could not be used for accurate stature determination. In total, 46 specimens were utilized to assess stature among the sample belonging to the Milwaukee Poor Farm Skeletal Collection; 41 of the specimens were osteologically sexed as male, and the remaining five were female.

The stature results were converted from millimeters to feet. Male stature ranged from 5.1 to 6.2 feet, whereas the female stature ranged from 4.5 to 5.5 feet (see tables 6.3 and 6.4). Many of the male specimens did not reach six feet, with most of them fluctuating between 5.4 and 5.8 feet. Although the ratio of females in this survey is considerably less, the sample demonstrated that four of the females did reach over five feet, and a single female was significantly smaller with an estimated stature between 4.5 to 4.7 feet. In comparison to males, females were overall smaller in stature—this, however, is a common sexually dimorphic trait between males and females. Additional
analysis of stature and its relevance in the Milwaukee County Poor Farm population will be addressed in the Discussion chapter.

Table 6.3 Stature Equation for White Males:
2.38 x Maximum Length of Right Femur + 64.41 ± 3.27

<table>
<thead>
<tr>
<th>Burial Number</th>
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</tr>
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<td>Burial Number</td>
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<td>Converted Stature (ft) Measurement with (-) Estimated Error</td>
</tr>
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<td>10622</td>
<td>50+</td>
<td>44</td>
<td>5.4</td>
<td>5.3</td>
</tr>
</tbody>
</table>

Table 6.4 Stature Equation for White Females:
2.47 x *Maximum Length of Right Femur* + 54.10 ± 3.72
Robusticity and Sexual Dimorphism

In order to measure the extent of robusticity throughout the skeletal remains, two elements were consistently evaluated. Limbs will often portray robusticity, especially in muscle attachment areas; for example, the linea aspera is a muscle attachment site located on the posterior side of the femur. The linea aspera may alter in size in response to stress, such as mechanical loading or repetitive movements. After long periods of stress, the morphology of the bone will alter and adapt to the demands upon it; for example, if an individual is performing heavy lifting or other mechanical loading activities, the linea aspera will increase in robusticity to accommodate the growing muscles of the lower limbs (Hogue and Dongarra 2002; Blackburn and Knüsel 2006; Wescott 2006; Pomeroy and Zakrzewski 2009). In addition, robusticity in the upper limbs (primarily in the humerus) can also denote long periods of stress and laborious activities (Mays 2002; Kujanova et al. 2008; Waidhofer and Kirchengast 2015). Lower and upper limbs of the entire sample size were subjected to non-metric observations in this study. Robusticity in lower limbs was accounted for via a robusticity scale which focused on the size of the linea aspera. The linea aspera was assessed on a scale of 1-3 based on appearance: (1) faint, (2), moderate, (3) strong (See Appendix II). In total, 43% of the specimens ranked a (2) on the linea aspera robusticity scale, 37% of the skeletal remains were assigned a (3) on the scale, and the individuals exhibited a (1) when assessed for robusticity in the lower limb. A cross-comparison of sex and the lower limb robusticity reveals that males were more likely to be assigned a (3), instead of a (2). In addition, skeletal remains that were unable to be sexed were predominantly assigned a (2) on the lower limb robusticity scale. Table 6.5 demonstrates the variation noted between sex and lower limb robusticity as
well as the average robusticity ranking assigned to male, female, and indeterminate remains of the Milwaukee County Poor Farm Collection. Robusticity in the upper limb was noted by examining the muscle marking throughout the shaft of both humeri (see Image 6.1 and 6.2)—there was no scale to assess the degree of severity, only that significant robusticity beyond what is normally expected was present or not. In total, 26 of the skeletal remains assessed were noted to have extreme upper limb robusticity.

Sexual dimorphism was assessed by comparing the robusticity and size of the upper and lower limbs belonging to both male and female specimens. Generally, the male humerus measured between 300-350 millimeters, where female humeri averaged between 290-340 millimeters; female upper limbs were consistently shorter in length, more gracile, and less robust than male humeri. Moreover, a comparison of male and female femora demonstrates similar results; for example, female femora length ranged between 350-450 millimeters, while male femora ranged between 405-518 millimeters. Although female and male lower limb lengths in this skeletal survey did share a 55-millimeter overlap, male femora were generally longer, and more robust. Overall, males tend to be larger than females cross-culturally, however, there are several intrinsic and extrinsic factors that play a role in this size difference, which will be assessed in the Discussion chapter.
Table 6.5  Robusticity Index Assigned to Sex Distribution

<table>
<thead>
<tr>
<th>Scale</th>
<th>Indeterminate</th>
<th>Female</th>
<th>Male</th>
</tr>
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<tbody>
<tr>
<td>(3)</td>
<td></td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>(1)</td>
<td></td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

Note the degree of robusticity around the shaft of the humerus. The muscle attachment is elevated and wraps around the shaft, altering the morphology of the bone.
Pathology and Trauma

There were 88 documented instances of pathological modification in the upper and lower limb bones of the Milwaukee County Poor Farm sample. Of the 88 individuals studied, 63 of the remains had identifiable pathological conditions and many of these individuals exhibited 1-3 of these biological modifications. Twelve different pathological conditions were observed throughout the study (see Table 6.6), many of which were associated with infections, mechanical loading, repetitive stress, trauma and/or age. Periostitis, a non-specific infection, accounts for nearly 40% of pathologies present in this sample, followed by a significant occurrence of lesions and osteophytic lipping. Although the remaining pathologies were few in number, they represent the most severe issues faced by this skeletal population. Photos and additional analysis of the present pathological conditions will be further assessed later in this report.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
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<td>Neoplasm</td>
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</tr>
<tr>
<td>Trepanematosis</td>
<td>1</td>
</tr>
<tr>
<td>Spur Growth</td>
<td>1</td>
</tr>
<tr>
<td>Osteolyphic Growth</td>
<td>1</td>
</tr>
<tr>
<td>Fusion</td>
<td>1</td>
</tr>
<tr>
<td>Eburnation</td>
<td>2</td>
</tr>
<tr>
<td>Biomechanical Remodeling</td>
<td>2</td>
</tr>
<tr>
<td>Osteomyelitis</td>
<td>3</td>
</tr>
<tr>
<td>Bowing</td>
<td>3</td>
</tr>
<tr>
<td>Osteolipping</td>
<td>17</td>
</tr>
<tr>
<td>Lesions</td>
<td>22</td>
</tr>
<tr>
<td>Periostitis</td>
<td>34</td>
</tr>
</tbody>
</table>
Periostitis, lesions, osteophytic lipping, and biomechanical remodeling are also indicative of healing processes in the skeletal system, especially in response to trauma. In total, there were nine instances of trauma documented in this sample and that can be broadly separated into two categories: fracture and amputation. Since it was not possible to cross-reference medical and/or burial records with the skeletal remains in this sample, the specific cause of trauma could not be established—however, since many of the amputations do exhibit extensive healing (e.g. smooth, round edges near the amputated site) (see Image 6.3) it may be assumed that the individual(s) lived for a significant period after the surgical procedure. However, five of the seven fractures noted in the skeletal survey are unhealed or were identified as perimortem breaks, meaning that the break took place at or around the time of death. These unhealed skeletal conditions provide a potential cause of death for a fraction of the Milwaukee County Poor Farm sample. Additional analysis of trauma will be provided in the Discussion chapter of this thesis.
Dissection Cuts

There were two skeletal remains that exhibited postmortem cuts on the lower limbs. These cuts are associated with dissection procedures that are completed by medical practitioners. Dissection cuts are performed with a sharp instrument and are completed after death—due to this, there are no signs of healing. The Milwaukee Poor Farm Cemetery was located near a hospital which may help to elucidate why dissection procedures were present on individuals from the cemetery. Further analysis of dissection and autopsy cuts will be acknowledged further later in this project.
CHAPTER VII: DISCUSSION

Analysis of Biological Variation of the Milwaukee Poor Farm Cemetery Collection

*Limb Asymmetry*

There are three basic forms of asymmetry, however, for the case of the Milwaukee Poor Farm Cemetery skeletal collection directional asymmetry was the primary focus throughout this project. Directional asymmetry is exhibited in the skeletal system when an individual regularly uses one side of their body to a greater extent than the other. Studies demonstrate that upper limb bias is the most common skeletal sided bias as it has to do with hand behavior (Glassman and Bass 1986; Mays 2002; Kujanova et al 2008; Meyer et al. 2011; Waidhofer and Kirchengast 2015). Directional asymmetry of the upper limbs can also be “seen as an effect of behavioral lateralization and handedness because hand preference results in differential mechanical stress” (Waidhofer and Kirchengast 2015: 510). A majority of the Milwaukee County Poor Farm sample size demonstrated a right-side bias, especially in their upper limbs. As directional asymmetry can be associated with repetitive movement or mechanical stress, forms of sociocultural and occupational behavior can be elucidated (Mays 2002; Kirchengast 2015).

Many occupants of the Milwaukee County Poor Farm were laborers, and as the city of Milwaukee continued to expand in terms of population and industrial development, occupational options were limited to those of lower socioeconomic status. Those who were admitted to the Milwaukee Poor Farm or buried in the Milwaukee County Poor Farm cemetery experienced economic hardships due to low wages at labor-
intensive jobs (Still 1948; Richards 1997; Richards 2016). In response to repetitive
mechanical loading, bone morphology can alter in order to adapt to the new
environmental demands placed upon it (Hogue and Dongarra 2002; Mays 2002;
Kujanova et al. 2008; Pomeroy and Zakrzewski 2009). The results from the Milwaukee
Poor Farm skeletal survey demonstrate that several of the individuals did experience
some form of stress as greater directional asymmetry was exhibited. As noted, it is
normal for an individual to exhibit asymmetrical characteristics due to side-bias,
however, if the deviation is greater than 1% the biological characteristic may be
pathological (Kujanova et al. 2008). Eleven individuals from the sample exhibited severe
limb asymmetry in their upper limbs and eight individuals exhibited asymmetry of the
lower limbs, which suggests that the individuals experienced some form of stress which
affected their limb morphology—this kind of stress could be linked to occupation or
environment (Mays 2002; Kujanova et al. 2008; Waidhofer and Kirchengast 2015).

The asymmetrical traits of the Milwaukee County Poor Farm are representative of
human behavior. Cross-culturally, humans typically tend to use their right side to a
greater degree than their left—again, this is exhibited in the Milwaukee County Poor
Farm skeletal sample (Waidhofer and Kirchengast 2015). The degree of severity can be
attributed to occupational and/or environmental stress. The lower socioeconomic status of
the Milwaukee County Poor Farm occupants and burials suggests that their lives were
filled with hardships that ranged from cultural bias, economic inequality, and
occupational hazards; as the Industrial Revolution permeated Milwaukee’s economic
infrastructure, mechanical/industrial plants became a primary option for occupation, in
addition to agriculture, trade, and other specialized jobs (Still 1948: Rippley 1985;
Richards 2016). Those belonging to a lower socioeconomic status were the primary workforce within these labor-heavy factories and plants and many of these jobs could affect bone morphology over a long length of time. In response to heavy lifting and repetitive movement, the skeletal remains of the Milwaukee County Poor Farm began to exhibit asymmetrical traits, reflecting the mechanical stress they experienced throughout life (Mays 2002; Kujanova et al. 2008; Waidhofer and Kirchengast 2015). In addition, although the sex distribution of this sample size was unequal, the five females did not exhibit as many asymmetrical traits as the males, which then also classifies these asymmetrical traits as sexually dimorphic. As many occupations of the 19th and early-20th century were divided by gender, males of the Milwaukee Poor Farm sample exhibit greater asymmetrical traits as their occupations consisted of hard labor, mechanical loading, and other repetitive tasks (Still 1948; Rippley 1985; Richards 1997; Hogue and Dongarra 2002; Mays 2002; Kujanova et al. 2008; Pomeroy and Zakrzewski 2009; Waidhofer and Kirchengast 2015; Richards 2016). However, due to the lack of female skeletal remains in this sample size, it is not possible to provide a more encompassing comparison between the male and female skeletal remains of the Milwaukee County Poor Farm. However, it can be surmised that the severe asymmetrical traits exhibited in the skeletons represent 19th and early 20th century sociocultural and occupational behavior (Mays 2002; Kujanova et al. 2008; Waidhofer and Kirchengast 2015).

**Stature**

By researching stature trends of populations, a sociocultural perspective can be applied to biological variation. Stature studies have primarily been carried out by biology researchers; however, during the 1970s anthropologists began investigating the
connection between stature, health, and culture (Steckel 2009). There are many intrinsic factors that will influence one’s stature throughout their lifetime, such as having a genetic predisposition for smaller stature, and even one’s sex and ethnicity. Extrinsic factors such as diet, occupation, socioeconomic status, and environment are relevant elements noted in stature research. There are several trends or patterns that can be assessed in stature studies—in the case of the Milwaukee Poor Farm skeletal collection, trends associated with population density, socioeconomic status, industrialization, and time period are all factors that influence a person or population’s stature (Roberts and Manchester 1995; Spencer Larsen 1997; Roberts and Cox 2003).

The results of this project show that most of the represented male skeletons fell within the 5.5-5.8 feet range. Census data from 1896 denotes that the average height of males located in North America is 5.5 feet, whereas males living in Europe averaged 5.4 feet in height (Roser et al. 2019). Many of the Milwaukee County Poor Farm occupants were immigrants or were of varying European backgrounds which mirrored the population of Milwaukee itself. For example, as a majority of Milwaukee, Wisconsin were of German descent and according to accessible death certificates and other reports between 1882-1910, over 1,000 Milwaukee County Poor Farm internments identified as being *native-born citizens*, following *unknown*, and then Germany. However, it should be noted that although the deceased individuals were identified as *native-born*, over 50% of the Milwaukee population “identified themselves as of German heritage” (Richards 2016: 21). The 1896 international height census data also denotes that the average stature of males who resided in Germany was 5.5 feet, which may suggest that a majority of the Milwaukee Poor Farm interments were of ‘average’ height for their ethnic background.
(Roser et al. 2019). As there are no records to cross-reference the deceased with place of birth or their ethnic background, it is difficult to know whether the individual’s stature is ‘average’ for the environment and era. In addition, this specific skeletal collection ranges from the years 1882-1925 and although this time period spans over twenty years, the census data can only provide an average stature for one year. Regardless, the 1896 international height demographic seems to be reflected in the Milwaukee Poor Farm survey as a majority of the male skeletons fell between 5.5-5.8 feet. The lack of stature census data can be attributed to simply the lack of collection—for example, aside from osteological analysis of skeletal collections, researchers must assess existent written records. Many of these historical records are military that may not be readily available to non-military personnel and are also gender-biased as women were not active in the military due to sociocultural constructs of that era (Komlos 1998; Roser et al. 2019). However, it can be noted that the female sample in this survey do exhibit a typical pattern, which is that females are typically smaller in stature compared to males. In addition, the 1896 census data asserts that female average height in the United States was 5.2 feet and in Europe ranged from 4.9-5.3 feet. This census data is comparable to the Milwaukee County Poor Farm female sample, which indicates that the individual’s height were average, dependent upon their ethnic background (Roser et al. 2019).

As previously noted, the skeletal collection ranges from 1882-1925 and there are no documents that associate a specific grave with the interred individual, making it impossible to know the exact date of death of each individual or gain further insights into life history—however, the time period of the cemetery does reflect temporal changes of height. It is at the beginning of the 18th century that there is an increase of stature of
Europeans within the United States. As the number of European immigrants began to increase in the United States, there was an increase in stature which is associated with immigrants moving to less-populous environments, having a more sustainable income, and less exposure to infectious diseases. However, between 1760-1800 there is a documented decrease in stature following the beginning of the Industrialization Revolution, and thirty years later (circa 1830-1860), a second decrease in stature was noted in the European population. Although industrialization increased globalized trade and occupational opportunities, it was accompanied by an increase in social and economic inequality, food prices, and population density which also plays a role in the spread of infectious disease and structural violence (Komlos 1998). All of these factors are relevant in the Milwaukee Poor Farm skeletal collection.

There were over 20 individuals whose estimated stature fell short of the 5.5-5.8 average of the skeletal sample and 1896 census data mean. One of lowest estimated stature of the sample was 5.1-5.3 inches—the individual was osteologically sexed as male and, although old age does play a role in reduced stature, the individual’s height is considerably shorter compared to the remainder of the sample. Reduced stature is also associated with poor health and stress experienced throughout an individual’s life. For example, if a person has an inadequate diet (i.e. low caloric intake or a lack of necessary vitamins/minerals) as a child, this could certainly stunt their growth and affect their height as an adult. An inadequate diet is also representative of other extrinsic factors, such as social and economic status within a population (Roberts and Manchester 1995; Spencer Larsen 1997). As the Industrial Revolution took hold of Milwaukee, Wisconsin the population density grew, thus creating greater competition for occupational
opportunities, living space, and other essential resources such as food, education, and access to medical assistance (Still 1948; Rippley 1985; Richards 2016). It can be deduced that many of the Milwaukee Poor Farm occupants belonged to a lower socioeconomic and possibly as a result, their stature may have been affected (Richards 1997; Richards 2016). Not all of the skeletal remains that were examined for stature in this survey sample exhibited extreme stress that affected their height; however, the sample did possibly exhibit trends indicative of the interments ethnic background and associated era. (Roser et al. 2019).

Robusticity and Sexual Dimorphism

Robusticity was present throughout the upper and lower limbs of the Milwaukee Poor Farm Cemetery collection. As observed, male skeletons of the skeletal survey demonstrated significant robusticity, especially throughout the humerus and along the shaft of the femur. Studies of human evolution and biological variation demonstrate that the degree of robusticity fluctuates depending upon several sociocultural and environmental elements. Biomechanical changes are representative of physical stress taking place throughout an individual’s life, especially when the stress is endured for long periods of time. Mechanical loading and/or other forms of repetitive stress (e.g. subsistence patterns, reoccurring movements associated with occupation) can affect the morphology of limb bones (Hogue and Dongarra 2002; Wescott 2006; Meyer et al. 2011).

During the 19th century, the city of Milwaukee, Wisconsin began to grow in response to industrialization—as more immigrants arrived in the port, a great many gained employment in industrial-related jobs. These occupations were not only dangerous but consisted of heavy lifting and long hours of repetitive, hard tasks (Still 1948). Those
who were admitted to the Milwaukee Poor Farm and/or buried in the cemetery were impoverished and a majority of them did participate in low wage, hard labor; for example, census data collected from the late 1890s denotes that nearly 300 of the Poor Farm occupants were laborers and 80 were farmers, followed by more specialized trades (Richards 1997). The robusticity exhibited throughout the humerus in male individuals in this sample is indicative of repetitive lifting and/or strenuous movement. As most occupations were divided by gender in the 19\textsuperscript{th} and 20\textsuperscript{th} century, it can be reasonably assumed that the degree of muscle marking throughout the limbs can be representative of hard labor. In addition, female remains that did exhibit high degrees of robusticity throughout their upper elements may be indicative of their occupation, including social status. The census data notes that over 80 of the female occupants of the poor farm were housewives, which during the 1890s included housework and other domestic and/or agricultural chores. Again, these movements related to occupation and social status may have played a role in upper limb robusticity, as people of higher status would not have participated in these occupational settings (Richards 1997). In the archaeological record it has been exhibited that those of elite status will not exhibit moderate or strong robusticity. For example, Spencer Larsen notes that in “ranked societies in the early contact era American Southeast, Africa, and Polynesia,” elite individuals did not have partake in laborious occupations or lifestyles, which was exhibited in the lack of robusticity throughout the skeletal structure when compared to those of lower social status (1997: 207).

The robusticity index for the lower limbs that was utilized for this project denotes that most individuals, both male and female, exhibited moderate to strong robusticity. A
majority of the males were scored a (3), followed by a (2), which indicates that the linea aspera (muscle attachment site) on the posterior side of the femur was larger and more distinct, and due to this the midshaft of the femur would be greater in circumference. The shape and size of the femur’s midshaft is often associated with mobility behavior (i.e. traveling long distances, subsistence patterns, or trade), mechanical loading (i.e. occupation or cultural tasks), and/or social roles (Wescott 2006; Pomeroy and Zakrzewski 2009). As many of the Milwaukee Poor Farm occupants and interments were industrial and agricultural laborers, the robusticity noted throughout their lower limbs can help explain the occupational and social stress that these individuals exhibited throughout their lives. When cross-referencing data collected from the robusticity index and the overall sex demographics of the sample, nearly 30 of the male skeletons were assigned a (3) or Strong, followed by (2) or Moderate. As previously noted, since males were more likely to work in agricultural and industrial-related occupations, it is possible that these experiences are manifested in the skeletal system. Moreover, although the representation of females in this sample is low, the robusticity index demonstrates similar results—of the 15 females, over half of the skeletal remains were assigned a (2) or (3) on the robusticity index of the lower limbs.

Robusticity can also be utilized as a sexually dimorphic trait when analyzing the Milwaukee Poor Farm Cemetery Collection. Universally, males are typically larger and more robust, while females are smaller and more gracile. Although these characteristics are commonly observed across human populations, there are several sociocultural and environmental factors that play a role in the degree of dimorphism between the two sexes (Hogue and Dongarra 2002; Pomeroy and Zakrzewski 2009). The Milwaukee Poor Farm
individuals did exhibit sexual dimorphism, as most males were larger and more robust than the females. Anthropological research has shown that energy expenditure does vary between the two sexes; for example, as females experience “childbearing, lactation, menstruation,” and other forms of social expectations dependent upon their culture, female size and skeletal traits are affected by these factors (Spencer Larsen 1997: 39). Additional studies show that the degree of sexual dimorphism can be influenced by the gender bias in occupational settings—again, industrial and agricultural jobs of the 19th and mid-20th centuries were primarily filled by males, and as noted a majority of the Milwaukee Poor Farm male occupants and interments experienced hard labor (Still 1948; Richards 1997; Richards 2016).

**Analysis of Other Manifestations Present on the Milwaukee Poor Farm Remains**

**Pathology and Trauma**

Over 70% of the Milwaukee County Poor Farm skeletal survey exhibited pathologies. The twelve types of pathologies are forms of infections, degenerative diseases, cancer, or biological responses to trauma. The most prevalent pathology noted throughout this skeletal sample was periostitis, which is a non-specific infection that creates inflammation throughout the cortical (external) bone. In addition, periostitis is caused by infection or trauma similar to lesions, which were the second most exhibited pathology noted in this collection (Roberts and Manchester 1995; White and Folkens 2005). If there are lesions exhibited throughout the skeletal remains, the individual 1) was experiencing an infection and/or form of trauma and 2) is in the process of healing, hence why the lesions are present (White and Folkens 2005). Lesions and periostitis can often be manifested on bones together or are often exhibited with other degenerative and
infectious diseases, or traumatic injuries (Roberts and Manchester 1995; White and Folkens 2005).

The number of lesions and diagnoses of periostitis assessed throughout the sample demonstrate that the individuals had experienced at least one period of stress during their lifetime. However, as lesions and periostitis represent physiological stress taking place, they also were in the process of healing (Roberts and Manchester 1995; White and Folkens 2005). The Milwaukee Poor Farm skeletal remains represent those of lower socioeconomic status, and as a result of their status, the individuals were more susceptible to infectious diseases. As their occupations often entailed hard labor with long hours and low wages, the individuals had a higher chance of developing infections, degenerative diseases (e.g. osteoarthritis) or becoming injured, which may result in secondary pathological conditions (Roberts and Manchester 1995; White and Folkens 2005; Armelagos et al. 2015). For example, the three individuals that exhibited osteomyelitis also had periostitis which further implies that the individual’s body was attempting to heal. Osteomyelitis is another non-specific infection that destroys bone cavities and is primarily documented in limb bones (Roberts and Manchester 1995). Image 7.1 is a tibia severely afflicted with osteomyelitis—aside from periostitis being present, the smooth ridges around the abscess indicate that the body was attempting to heal. Due to the size of the abscess it can be surmised that the individual lived for a relatively long period of time with this infection (Roberts and Manchester 1995; White and Folkens 2005).

Other notable pathological patterns in this sample are the number of degenerative diseases present. Overall, there were nearly 20 cases of osteoarthritis exhibited in three
reoccurring forms: osteophytic lipping (see Images 7.2 and 7.3), bone growths (usually a form of cancer), and eburnation, which is when an articulation point or joint of two bones demonstrates erosion of the cartilage capsule, thus creating a shiny, polished surface on the associated bones due to bone-on-bone friction. These degenerative diseases affect the joints and are associated with aging and occupational stress. As a majority of the skeletal remains were osteologically sexed to be between 35-50 years old, followed by individuals 50+ years of age,, it is expected that in combination with their age individuals from a lower socioeconomic background and belonging to a lower socioeconomic class in their adulthood, as well as working labor intensive jobs throughout their life would have a higher chance of developing osteoarthritis and/or other degenerative diseases (Roberts and Manchester 1995; White and Folkens 2005; Armelagos et al. 2015).

Some of these pathological conditions may be a response to prior trauma. For example, all of the individuals with fractures in the sample also exhibited either lesions or periostitis. These breaks indicate that the deceased had experienced some form of severe trauma (fractures and amputations alike), and if the bone is able to remodel in response to this trauma, this process also demonstrates that the individual has the relative “health” necessary to heal (Ornter 1985; Roberts and Manchester 1995; White and Folkens 2005). Even though healing may take place, the morphology of the bone may be permanently affected; for example, Burial Number 10280 (see Images 7.4) exhibits a healed fracture, however, the femur has remodeled during the healing process. As a result of healing, the shaft of the left femur has become more robust and shorter in comparison to the right. There is a significant difference in limb lengths between the two femora—this remodeling of the fracture would have, in effect, caused a limp when the individual
walked. In addition, the way in which the fracture healed can provide some details of the person’s life: 1) they did not receive immediate medical attention that could have helped re-set the broken femur, 2) they were healthy enough that the body was able to respond and heal the fracture, and 3) their inability to access medical aid may be due to their socioeconomic status (Ortner 1985; Roberts and Manchester 1995; White and Folkens 2005). Further analysis of trauma and dissection will be discussed in the Cross-Comparison section of this chapter.
Note the lipping on the articulation points of the ulna.
Note the thickness around the shaft of the femur.

The comparison photo of both femora demonstrates the difference in limb length and the extent of the remodeling in response to a fracture.
Cross-Comparison between the Milwaukee Poor Farm and Three Relevant Case Studies

Comparable Demographics

There were consistent trends noted between the four case studies in the referenced research. The Milwaukee County Poor Farm sample of this project was predominantly male, with very few females present. Similar to the Milwaukee County Poor Farm, the New York Albany County Almshouse and the Colorado State Asylum also served mostly males; however, the Cook County Poor House did not demonstrate a particular gender bias (Richards 1997; Bloom 2001; Solano 2006; McGloin 2012; Magennis and Lacy 2014; Richards 2016; Luisgnan Lowe 2017). As many of these types of cemeteries yield mostly male skeletal remains, this suggests that male occupants/patients of these institutions would be more likely be admitted for longer periods of time and to be buried in the associated cemeteries. The sex distribution and bias noted in many almshouses, institutions, and poor farm cemeteries can be explained as many of the long-term occupants were male (Richards 1997; Magennis and Lacy 2014).

All of the facilities served people of similar backgrounds. Admission and census data of the Milwaukee County Poor Farm, the Cook County Poor House, New York Albany County Almshouse, and Colorado State Asylum show that a majority of the patients/occupants of the facilities were of lower socioeconomic status and foreign-born (Richards 1997; Bloom 2001; Solano 2006; McGloin 2012; Magennis and Lacy 2014; Richards 2016). As the most prominent immigrant group in Milwaukee, Wisconsin were of German ancestry, it can be reasonably assumed that many of the occupants of the Poor Farm were also of German background (Rippley 1985; Richards 2016). According to 1851-1853 admissions, over half of the Cook County Poor House was Irish, followed by
Swedish, English Norwegian, French, Scottish, and Hungarian individuals (Bloom 2001). The New York Albany County Almshouse and the Colorado State Asylum’s records indicate that they both served individuals of similar ethnic backgrounds (Solano 2006; Magennis and Lacy 2014). All four facilities admitted those of lower socioeconomic status and the associated cemeteries were utilized for the 1) patients/occupants of the institution, 2) those who were unclaimed after death, or 3) those who could not afford a burial (Richard 1997; Bloom 2001; Solano 2006; McGloin 2012; Richards 2016; Strange 2017).

*Biological Manifestations in the Skeleton*

The Milwaukee County Poor Farm, Cook County Poor House, New York Albany County Almshouse, and Colorado State Asylum cemeteries were all the subjects of archaeological and osteological investigations. The research projects of these associated facilities have provided insight into how individuals of this era with similar socioeconomic background responded to environmental and occupational stress through the various traumas, pathologies, and even biological variation that manifested in their skeletal remains. For example, the Milwaukee Poor Farm skeletal sample exhibited over 60 instances of pathology—a majority of these conditions were signs of infection or degeneration. Similar findings were observed in the New York Albany County Almshouse and Cook County Poor House osteological examinations. Many of the skeletal remains exhibited osteoarthritis, periostitis, and lesions which were reoccurring conditions of the Milwaukee Poor Farm individuals (Bloom 2001; Solano 2006). All of these pathologies can be representative of environmental, occupational, or social stress that the individual experienced throughout their lifetime. Importantly, while periostitis
and lesions indicate that the individual suffered from an infection, the conditions also
demonstrate that healing was taking place (Ortner 1985; Roberts and Manchester 1995;
White and Folkens 2005).

Biological remodeling was seen in all four case studies, especially in response to
trauma and environmental stress. For example, some skeletal remains of Milwaukee
County Poor Farm, Cook County Poor House, New York Albany County Almshouse,
and Colorado State Asylum archaeological surveys exhibited evidence of trauma. The
forms of trauma (i.e. fractures and amputations) that were noted throughout the skeletal
collections could be associated with occupational hazards or interpersonal violence
(Roberts and Manchester 1995; Solano 2006; Nystrom 2014). All four of these facilities
were located in urban settings during the Industrial Revolution. During this era, these
four cities experienced a population increase alongside a rise in socioeconomic
inequality, the spread of infectious diseases, and the occupational hazards of
industrial/mechanical or mining businesses (Still 1948; Rippley 1985; Richards 1997;
Duis 1998; Bloom 2001; McGloin 2012; Magennis and Lacy 2014; Richards 2016;
Lusignan Lowe 2017). The Milwaukee Poor Farm skeletal sample exhibited severe
trauma and the New York Albany County Almshouse osteological studies yielded similar
findings—it was determined that male skeletal remains exhibited the most severe trauma
in both samples (Solano 2006).

Other forms of bone remodeling were exhibited throughout all four facilities,
however, robusticity was a primary focus in this project. Current research utilizing the
New York Albany County Almshouse skeletal remains provides parallel findings to the
Milwaukee County Poor Farm sample of this project. For example, both the New York
Albany County Almshouse and Milwaukee County Poor Farm skeletal remains demonstrate moderate to severe robusticity throughout their upper and lower limbs. Since both populations were of lower socioeconomic status and located in large urban settings, their occupations demanded hard physical labor with repetitive movement and heavy mechanical loading (Richards 1997; Solano 2006; Richards 2016; Lusignan Lowe 2017). Solano (2006) also notes that child-labor laws had not been enacted until the late 1930s, which may explain extreme robusticity and other forms of bone remodeling throughout almshouses and poor farm remains—especially if the individuals practiced hard labor that began in childhood and continued throughout their life.

The Role of Facilities and the Treatment Towards the Occupants, Both Living and Dead

The occupants of the Milwaukee County Poor Farm, Cook County Poor House, New York Albany County Almshouse, and the Colorado State Institution experienced extreme hardship prior to their occupancy of these facilities that, unfortunately, continued on after their admission as patients or residents. All of the facilities were cited for overcrowding, poor sanitation, and ill-treatment of the occupants (Grauer and McNamara 1995; Richards 1997; Duis 1998; Bloom 2001; McGloin 2012; Richards 2016; Grauer et al. 2017; Lusignan Lowe 2017). In addition, some facilities also experienced further issues such as the Cook County Poor House which struggled with corruption in the facility’s Board of Supervisors, severe abusive treatment towards the occupants, and body snatching scandals (Duis 1998; Bloom 2001; Grauer et al. 2017). All four of the facilities required that the occupants/patients provide labor, if physically able—it can be presumed that, in addition to physical stress, many of the occupants also had mental health issues as a result of their difficult lives in conjunction with the ill-treatment they
experienced at the poor farm, almshouse, or institutions (Bloom 2001; Solano 2006; McGloin 2012; Magennis and Lacy 2014; Richards 2016).

Dissection of the skeletal remains must also be addressed in this chapter, as it demonstrates the lack of respect and dignity that was shown towards the occupants of poor houses, almshouses, asylums/institutions. Three of the four case studies referenced in this project observed dissection cuts in the analysis of the skeletal remains—the Milwaukee County Poor Farm, Cook County Poor House and the New York Albany County Almshouse. All three of these facilities were near and/or associated with hospitals that had medical training centers for students (Richards 1997; Duis 1998; Bloom 2001; Solano 2006; Richards 2016; Luisignan Lowe 2017). The Cook County Poor House experienced many instances of the bodies of recently deceased and buried patients being stolen from their graves and sold to local medical schools—similar issues are noted in the other three case studies. What allowed the practice of dissection of patients/occupants to continue for such a long period and to such a great extent was one simple, yet devastating mindset shared by these facilities and medical practitioners: the patients/occupants were unequal and lesser (Duis 1998; Bloom 2001; Grauer et al. 2017). Many of the individuals who were not claimed after death were used for dissection purposes and subsequently buried in the cemetery—however, there are some cases where the body continued to be used post-dissection. For example, some of the osteological remains of the New York Albany County Almshouse exhibited drill holes on the skull, indicating that the remains were used as study skeletons (Lusignan Lowe 2017). There were only two dissection cases noted in the Milwaukee County Poor Farm sample of this project, however, the skeletal indices and other research conducted on this collection show that
some individuals were buried with medical waste, or their biological remains were scattered in secondary burial pits after they were utilized for dissection purposes (Richards 1997; Richards 2016). Image 7.5 is a visual representation of different forms of burials exhibited in the Milwaukee County Poor Farm cemetery (i.e. a single burial, multiple burials, or commingled), and burials are certainly representative of their lower sociocultural class due to the treatment and/or lack thereof the individuals experienced after death. As noted, some of the remains were commingled and were interred with medical waste (i.e. Photos B, C, and D). These actions undeniably demonstrate the lack of compassion or care that was applied to the burial services of the Milwaukee County Poor Farm occupations or local poor. The postmortem treatment of the Milwaukee County Poor Farm, Cook County Poor House, New York Albany County Almshouse and also Colorado State Asylum’s departed patients provides an important glimpse into the sociocultural reality, and often unfortunate circumstances these individuals endured.
A comparison photo of the different forms of burials present in the Milwaukee County Poor Farm Cemetery
(Image 7.5 taken from Richards 2016)
CHAPTER VIII: LIMITATIONS

Although this research did yield a great amount of data, it is important to note that the author did experience limitations. The limitations of this thesis were divided into two categories: methodological and osteological. These constraints experienced throughout the data collection process and analysis did influence the ways in which the results and discussion could be represented. Both of these limitations will be discussed in more detail in the sections below.

Methodological

The 1991 and 2013 archaeological surveys of the Milwaukee County Poor Farm cemetery yielded over 2,000 burials (Richards 2016). For this thesis, only 88 skeletal remains were analyzed—88 skeletons do not provide an accurate representation of the Milwaukee Poor Farm skeletal collection. As the author had a time constraint of ten days to complete data collection, 50-100 skeletons were the ideal sample size for this master’s thesis in conjunction with other poor farm case studies. Moreover, there was a significant sex bias the skeletal remains, as nearly 80% of the skeletal sample was male. Due to this, females are not accurately represented in the Milwaukee Poor Farm cemetery sample employed in this analysis.

In addition, measurement error is an important limitation to address as human error can occur during the data collecting process. White and Folkens’ (2005) error estimation procedure was utilized to determine measurement error for each bone and associated dimension (see Appendix IV). Tables 8.1 and 8.2 provide the degree of
measurement error of each bone of this project. The value of each measurement represents the interobserver error of the author, and also “informs the audience about how repeatable any given measurement is” of the osteological data present (White and Folkens 2005: 343). According to Tables 8.1 and 8.2, the author ranged from 0-2 millimeters of error of the upper limbs, whereas the lower limbs ranged from 0-1.62 millimeters in potential error. The estimation of intra-observer error demonstrates that although quantitative methods are used to establish the preciseness of research, human error can affect the results.

Osteological

The “Osteological Paradox” can be applied to a majority of the Milwaukee Poor Farm skeletal sample. Many of the skeletal remains exhibited signs of infections, such as lesions, periostitis and other debilitating pathologies (i.e. osteomyelitis, trepanematosis). Although these pathological conditions demonstrate the individual was experiencing severe stress and health-related issues, the presence of lesions reveals that they were also in the process of healing (Ornter 1985; Pinhasi 2013). In addition, there also were a great number of Milwaukee Poor Farm cemetery interments that did not exhibit lesions or other pathological manifestations on their bones. The lack of lesions may not be a representation of ‘good’ health, as the skeletons did not show signs of healing or an adaptative response to a disease. The manifestations in the bone and even the lack thereof can reflect a dual narrative on the individuals’ or population’s health—due to this, it is difficult to address health in historic populations just by assessing the skeletal remains (Ortner 1985; Pinhasi 2013).
Another osteological-related limitations encountered throughout this project was the preservation of the skeletal remains. The Milwaukee County Poor Farm Cemetery had been unbothered for several decades until it was disturbed in the late 20th century (Richards 1997; Richards 2016). Prior to excavation, the skeletal remains experienced standard taphonomy processes, such as erosion caused by soil or water damage. Following the excavation, skeletal remains experienced additional taphonomic processes such as damage caused by construction and other environmental processes once the bones were uncovered. These taphonomic processes can alter the preservation of the skeletal remains (White and Folkens 2005). In addition to these processes, following the curation of the Milwaukee Poor Farm skeletal collection researchers have also accessed the remains for their own investigations. As these skeletons continue to be examined, the preservation of the remains has been affected, which can create a greater margin of error or affect sample sizes depending upon the research focus (White and Folkens 2005).
Table 8.1
Degree of Measurement Error for Upper Limbs

<table>
<thead>
<tr>
<th>Bone and Measurement</th>
<th>Average Value of Error in Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Humerus</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>.66</td>
</tr>
<tr>
<td>Bicondylar Length</td>
<td>.6</td>
</tr>
<tr>
<td>Circumference of Midshaft</td>
<td>.89</td>
</tr>
<tr>
<td>Maximum Diameter of Head</td>
<td>.46</td>
</tr>
<tr>
<td>Maximum Breadth of Distal Epicondyle</td>
<td>.48</td>
</tr>
<tr>
<td><strong>Radius</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>.5</td>
</tr>
<tr>
<td>Circumference of Midshaft</td>
<td>.18</td>
</tr>
<tr>
<td>Maximum Diameter of Head</td>
<td>1.76</td>
</tr>
<tr>
<td><strong>Ulna</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>0</td>
</tr>
<tr>
<td>Circumference of Midshaft</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 8.2
Degree of Measurement Error for Lower Limbs

<table>
<thead>
<tr>
<th>Bone</th>
<th>Average Value of Error in Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Femur</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>0</td>
</tr>
<tr>
<td>Bicondylar Length</td>
<td>1.11</td>
</tr>
<tr>
<td>Circumference of Midshaft</td>
<td>.66</td>
</tr>
<tr>
<td>Maximum Diameter of Head</td>
<td>.11</td>
</tr>
<tr>
<td>Maximum Breadth of Distal Epicondyle</td>
<td>.59</td>
</tr>
<tr>
<td><strong>Tibia</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>.5</td>
</tr>
<tr>
<td>Circumference of Midshaft</td>
<td>.18</td>
</tr>
<tr>
<td>Width of Proximal Epicondyles</td>
<td>1.62</td>
</tr>
<tr>
<td>Width of Distal Epicondyles</td>
<td>.32</td>
</tr>
<tr>
<td><strong>Fibula</strong></td>
<td></td>
</tr>
<tr>
<td>Maximum Length</td>
<td>0</td>
</tr>
</tbody>
</table>
CHAPTER IX: CONCLUSION

The goal of this thesis was to identify factors of sociocultural landscapes through the assessment of biological variation and other manifestations in the skeletal remains of the Milwaukee County Poor Farm burials. Limb asymmetry, stature, sexual dimorphism and robusticity were the examined forms of biological variation, as well as other manifestations such as pathology, trauma, and dissection. All of these biological displays are caused by a variety of intrinsic and extrinsic factors that these individuals experienced during their life—as consistently noted throughout this project, the skeletal remains of the Milwaukee County Poor Farm cemeteries exhibited biological indicators of individuals who led hard, difficult lives (Richards 1997; Roberts and Cox 2003; Strange 2010; Richards 2016; Milligan 2017). This concluding chapter will emphasize how health and culture played significant roles in the Milwaukee Poor Farm occupant’s quality of life, and how these narratives can be assessed after death.

Stress and Bone Biology

How the body responds to stress is dependent upon a multitude of factors, such as an individual’s socioeconomic status and cultural understanding of health, including their environment, occupation, and even age and gender (Roberts and Cox 2003). Those interred in the Milwaukee County Poor Farm cemetery were individuals of lower socioeconomic status, many were immigrants or of Euro-American background, and they were considered deviants by the dominant society (Richards 1997; Strange 2010; Richards 2016; Milligan 2017). The life experiences of these particular individuals may be described as difficult and unfortunate--the biological manifestations assessed in the
bones of the Milwaukee Poor Farm skeletal remains can provide a broader narrative of stress and health in this historic population.

McElroy and Townsend (2015) discuss how the amount of stress a person experiences during their lifetime can manifest itself in different ways (Image 9.1). McElroy and Townsend’s Process of Stress is divided into three responses: “(a): adaptation as the response range expands, (b) strain from inadequate or inappropriate response, or (c) initial adaptation but delayed strain (2015: 213). These responses were noted in the Milwaukee County Poor Farm skeletal sample, especially in terms of biological variation. For example, the skeletal remains that exhibited extreme robusticity throughout their limbs do, in fact, represent individuals that were adapting to their environment—possibly evincing occupational and sociocultural experiences (Hogue and Dongarra 2002; Wescott 2006; Meyer et al. 2011). In addition, the skeletal remains of the Milwaukee Poor Farm burials that exhibited extreme directional asymmetrical traits or pathological conditions such as periostitis, or lesions demonstrate that forms of adaptation or healing took place even as biological tissue was being remodeled or damaged in the process (Ortner 1985; Roberts and Manchester 1995; White and Folkens 2005; Kujanova et al. 2008; Waidhofer and Kirchengast 2015).

Wolff’s Law is particularly relevant to the Milwaukee County Poor Farm remains as their skeletons demonstrate how stress (i.e. mechanical loading, repetitive movement), disease, and trauma can affect the morphology of bones (Hogue and Dongarra 2002; Blackburn and Knüsel 2006; Mayer et al. 2011). As many immigrants in Milwaukee were laborers during the Industrial Revolution, it can be presumed that their working hours consisted of heavy lifting and repetitive movements for long periods of time (Richards
The biological manifestations present in the skeletal remains may represent strain caused by occupational and environmental hazards experienced by the individuals within the Milwaukee County Poor Farm skeletal sample—however, it is impossible to be certain. The skeletal remains of the Milwaukee County Poor Farm Cemetery do exhibit significant stress—however, the origins of this stress can only be speculated.

Defining the Roles of Health and Culture

The relationship between health and culture is complex, especially since it involves a number of different factors. A reoccurring topic in health studies, as well as anthropological and osteological research regarding health and disease is social inequality; as it has plagued past human populations and remains one of the most significant issues today. (Roberts and Manchester 1995; Spencer Larsen 1997). Social
inequality is comprised of several facets and can affect a person’s quality of life, especially in terms of living and working conditions, access to medical care, and livable wages (Armelagos et al. 2015). In the case of the Milwaukee County Poor Farm, the occupants evince extreme social inequalities, as they were admitted to a facility that experienced severe overcrowding and sanitation issues; their injuries or illnesses were likely the cause of occupational hazards and their burials were low-cost (Richards 1997; Richards 2016). These social inequalities are manifested in the skeletal remains of the poor farm burials, especially in terms of pathology, trauma, and other forms of biological variation.

Skeletons of the Milwaukee County Poor Farm exhibited strong robusticity and sexually dimorphic traits, atypical directional asymmetry and stunted stature, in addition to other pathological or traumatic conditions. As so many of these remains demonstrated these health-related issues, it can be determined these individuals suffered the conditions of social inequality at some point in their life (Richards 1997; Strange 2010; Richards 2016; Milligan 2017). The health of the Milwaukee County Poor Farm skeletons was directly influenced by the sociocultural landscape in which they lived. During the late 18th and early-19th century the paupers of the poor farm were considered the undesirables of the dominant Western society. The construction of the Milwaukee County Poor Farm was a means of separating and isolating those of lower-socioeconomic status, including the mentally and physically ill from the higher social classes (Spencer-Wood 2001; Spencer-Wood and Baugher 2001; Richards 2016). The findings of this research is not just relevant to understanding the social experience of individuals at the Milwaukee County Poor Farm but also the Cook County Poor House, New York Albany County
Almshouse, and the Colorado State Asylum. These facilities were created to serve and aid vulnerable populations and all four failed in doing so—these organizations became an “institutional trap” of the occupants (Duis 1998: 321). The goals of the institutions were to feed the poor and cure the mentally/physically ill but, in fact, the facilities’ reoccurring problems (i.e. overcrowding, sanitation issues, abusive medical staff) in effect created more stress and health-related issues for the unfortunate occupants (Grauer and McNamara 1995; Duis 1998; Richards 1997; Bloom 2001; Spencer-Wood 2001; Spencer-Wood and Baugher 2001; Solano 2006; McGloin 2012; Richards 2016; Grauer et al. 2017; Lusignan Lowe 2017).

Concluding Remarks

It can be concluded that the individuals interred in Cemetery 2 at the Milwaukee County Poor Farm led difficult lives. Aside from the skeletal remains examined for this project, the burial pits demonstrate the lack of empathy and care that the individuals experienced in life was extended after death as their coffins (if they were given one) were low cost, some were buried with medical waste, while others were buried in secondary pits after their bodies were dissected by medical practitioners (Richards 1997; Richards 2016). The biological manifestations present in the Milwaukee County Poor Farm skeletons examined for this project, do in fact, indicate that the individuals buried at this institution experienced stress throughout their lifetime. Furthermore, the investigation of limb asymmetry, robusticity, sexual dimorphism and stature and other biological manifestations of the Milwaukee County Poor Farm skeletons provides a sociocultural account of the historic population, and in doing so yields an unfortunate narrative of the Milwaukee County Poor Farm cemetery interments in the late 19th and early 20th century.


### APPENDIX I:

#### Table 19.2
Equations Used to Estimate Stature, in Centimeters, with Standard Error, from the Long Bones of Various Groups of Individuals between 18 and 30 Years of Age

<table>
<thead>
<tr>
<th></th>
<th>White Males</th>
<th>Black Males</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>White Males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.08 × Hum + 70.45 ± 4.05</td>
<td>3.26 × Hum + 62.10 ± 4.43</td>
<td></td>
</tr>
<tr>
<td>3.78 × Rad + 79.01 ± 4.32</td>
<td>3.42 × Rad + 81.56 ± 4.30</td>
<td></td>
</tr>
<tr>
<td>3.70 × Uln + 74.05 ± 4.32</td>
<td>3.26 × Uln + 79.29 ± 4.42</td>
<td></td>
</tr>
<tr>
<td>2.38 × Fem + 61.41 ± 3.27</td>
<td>2.11 × Fem + 70.35 ± 3.94</td>
<td></td>
</tr>
<tr>
<td>2.68 × Fib + 71.78 ± 3.29</td>
<td>2.19 × Fib + 85.65 ± 4.08</td>
<td></td>
</tr>
<tr>
<td><strong>White Females</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.36 × Hum + 57.97 ± 4.45</td>
<td>3.08 × Hum + 64.67 ± 4.25</td>
<td></td>
</tr>
<tr>
<td>4.74 × Rad + 54.93 ± 4.24</td>
<td>2.75 × Rad + 94.51 ± 5.05</td>
<td></td>
</tr>
<tr>
<td>4.27 × Uln + 57.76 ± 4.30</td>
<td>3.31 × Uln + 75.38 ± 4.83</td>
<td></td>
</tr>
<tr>
<td>2.47 × Fem + 54.10 ± 3.72</td>
<td>2.28 × Fem + 59.76 ± 3.41</td>
<td></td>
</tr>
<tr>
<td>2.93 × Fib + 59.61 ± 3.57</td>
<td>2.49 × Fib + 70.90 ± 3.80</td>
<td></td>
</tr>
<tr>
<td><strong>East Asian Males</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.68 × Hum + 83.19 ± 4.25</td>
<td>2.92 × Hum + 73.94 ± 4.24</td>
<td></td>
</tr>
<tr>
<td>3.54 × Rad + 82.0 ± 4.60</td>
<td>3.55 × Rad + 80.71 ± 4.04</td>
<td></td>
</tr>
<tr>
<td>3.48 × Uln + 77.45 ± 4.66</td>
<td>3.56 × Uln + 74.56 ± 4.05</td>
<td></td>
</tr>
<tr>
<td>2.15 × Fem + 72.57 ± 3.80</td>
<td>2.44 × Fem + 58.67 ± 2.99</td>
<td></td>
</tr>
<tr>
<td>2.40 × Fib + 80.56 ± 3.24</td>
<td>2.50 × Fib + 75.44 ± 3.52</td>
<td></td>
</tr>
</tbody>
</table>

*a To estimate stature of older individuals, subtract 0.06 (age in years, 30 cm; to estimate cadaveric stature, add 2.5 cm.

From Trotter (1970). The tibia is not included; see text for rationale.

All lengths used are maximum lengths.
APPENDIX II:
Robusticity Index

(1) **Faint**
The linea aspera is slightly elevated, but the muscle marker ridges are rounded and are not sharp. A faint linea aspera is smooth and not too pronounced as the muscle marker does not reach ¼ inches.
(2) Moderate

The linea aspera is elevated, but the ridges are not sharp and does not resemble a crest. A moderate linea aspera is also pronounced but does not exceed ¼ inch.
(3) **Strong**

The linea aspera is elevated, extremely pronounced and the ridge of the muscle marker is sharp and rough. A strong linea aspera exceeds \( \frac{1}{4} \) inch and may reach up to \( \frac{3}{4} \) of an inch.
### APPENDIX III:
Microsoft 2016 Data Collection Spreadsheet

<table>
<thead>
<tr>
<th>Limb</th>
<th>HUMERUS</th>
<th>RADIUS</th>
<th>ULNA</th>
<th>FEMUR</th>
<th>TIBIA</th>
<th>FIBULA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Length</td>
<td>Maximum Length</td>
<td>Maximum Length</td>
<td>Maximum Length</td>
<td>Maximum Length</td>
<td>Maximum Length</td>
</tr>
<tr>
<td></td>
<td>Bicondylar Length</td>
<td>Circumference of the midshaft</td>
<td>Circumference of the midshaft</td>
<td>Bicondylar Length</td>
<td>Circumference of the midshaft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Circumference of the midshaft</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum diameter of the head</td>
<td></td>
<td></td>
<td>Maximum diameter of the head</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maximum breadth of distal epicondyle</td>
<td></td>
<td></td>
<td>Maximum breadth of distal epicondyles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Burial No.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Age</td>
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</tr>
<tr>
<td>Pathology Present</td>
<td>Y</td>
<td>N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notes</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Robusticity Index:</th>
<th>Faint (1)</th>
<th>Moderate (2)</th>
<th>Strong (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEMUR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linea Aspera</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX IV:

1. The first measurement of the limb bone is taken. This is measurement I.
2. Wait at least a day to take the second measurement to ensure that the first measurement taken does not affect the remeasure. The second measurement is II.
3. Once more, wait another day to take the third measurement to avoid influence on remeasures. The third measurement is III.
4. In total, there are three measurements. To determine the average of these measurements, divide the sum of the three measurements by the number of measurements taken.

\[
\text{(I + II+ III ÷ number of measurements= average measurement)}
\]

5. To determine the error, calculate the difference between the overall average and the individual measurements; then divide the sum of all three measurements by the number of measurements taken.

\[
\text{(I: average measurement – original measurement = difference)}
\]
\[
\text{(II: average measurement – original measurement= difference)}
\]
\[
\text{(III: average measurement – original measurement = difference),}
\]

\[
(I)\text{Difference + (II) Difference+ (III) Difference = ∑,}
\]

\[
\sum \div \text{number of measurements= measurement error}
\]