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The Saints Peter and Paul Parish and the Milwaukee County Poor Farm: A Comparative Osteological Analysis Between Two Historic Cemeteries in Wisconsin

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THE SAINTS PETER AND PAUL PARISH AND THE MILWAUKEE COUNTY POOR FARM: A COMPARATIVE OSTEOLOGICAL ANALYSIS BETWEEN TWO HISTORIC CEMETERIES IN WISCONSIN

by

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ABSTRACT

THE SAINTS PETER AND PAUL PARISH AND THE MILWAUKEE COUNTY POOR FARM: A COMPARATIVE OSTEOLOGICAL ANALYSIS BETWEEN TWO HISTORIC CEMETERIES IN WISCONSIN

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David M. Strange

University of Wisconsin-Milwaukee, 2017
Under the supervision of Dr. Robert J. Jeske

The constituents of the Saints Peter and Paul Parish of Independence, Wisconsin contracted Commonwealth Heritage Group in 2015 to excavate and analyze 108 individuals located in an unmarked portion of the parish cemetery during a large church renovation project. This thesis is an osteological analysis of the excavated cemetery population, providing an estimated age, sex, and pathological profile of the individuals interred therein. In addition, a comparative analysis is conducted between subadult segments of the Ss. Peter and Paul Parish sample and the Milwaukee County Poor Farm Cemetery located in Wauwatosa, Wisconsin. The parameters of the analysis include the investigation of the rates of common pathological lesions observed between the two populations as a proxy for developmental stress. In addition, a comparison of long bone growth rates is incorporated as a second line of evidence toward the assessment of developmental vulnerability. It was expected that the MCPFC sample would be characterized as under more risk factors than the Ss. Peter and Paul Parish sample. Results suggest that the rural Ss. Peter and Paul sample experienced fewer lesions and other markers of disease than the sample from the more urban cemetery at the Milwaukee county Poor Farm. Long bone lengths also suggest that the rural population was generally healthier and larger than the contemporaneous urban population.

For my mother,

who gave me everything.

I miss you, always.

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I would first like to thank my committee members, Dr. Robert Jeske, Dr. Patricia Richards, and Dr. Jordan Karsten, for their guidance, encouragement, and friendship in this endeavor. I owe a debt of gratitude to Brian Nichols for his quick and timely assistance in retrieving the necessary MCPFC data and getting it to me when the orientation of my research changed. I would also like to extend my gratitude toward Dr. Emily Epstein, Catherine Jones, Alexis Jordan, Shannon Freire, and Jessica Skinner for their support, encouragement and, most of all, their vast expertise and willingness in training me in bioarchaeological analytic methods. My career and this thesis would look very different than it does today without the intervention of these individuals. I also acknowledge my fellow cohort, including but not limited to Richard Edwards IV, Katherine Sterner, Rachel McTavish (thanks for all the cupcakes!), Robert Ahlrichs, and Natalie Carpiaux. Without the friendship and encouragement from these individuals it is entirely possible that this thesis would not have seen the light of day. At the very least, they helped keep me sane. I would like to extend my heartfelt gratitude and thanks to my father, James Strange III, my sister Anne, and my brothers John and James IV. Knowing I had my family firmly in my corner and knowing they believed in me every step of the way made this journey significantly smoother. Finally, I must also extend my gratitude to the constituents of the Ss. Peter and Paul Parish for their eager cooperation and interest in allowing this project and subsequent research to move forward. As an archaeologist, it is extremely gratifying to work with such agreeable stakeholders.

Chapter One: Introduction and Statement of Research

The potential cultural value of the historic cemetery is immense, leading some to categorize it in line with the traditional museum in terms of its value as a repository of the past (Meyer 1989:2). Dethlefson and Deetz (1967:40) note that cemeteries are paradoxically the type of historic site that archaeologists can be assured that something of interest lay beneath the ground while at the same time being reluctant to dig there. Nevertheless, when archaeologists excavate and analyze a cemetery population, the recovered skeletal material gives us the strongest link to the lives of past individuals and populations. Thus, cemeteries represent a conveniently grouped together wealth of cultural information bound within sacred or secular boundaries that serve as very tangible intermediaries between ourselves and our past.

Analysis conducted upon skeletons recovered from historic cemeteries can tell us much more about the lives of past populations than about how they died (Agarwal 2016). Furthermore, skeletal remains can provide important information about the study of human variation. Skeletons from specific localities are more homogeneous both in terms of genetics and the environment, allowing for interregional comparative analyses that may illuminate differential aspects of life, such as demographics, nutritional and environmental stress, disease susceptibility, and growth and development, between populations (Larsen 1997, Lewis 2007). It is also the case that children represent one of the more vulnerable segments of a society, and that when juvenile osteological material is available for analysis it is among the most direct and intimate indicators of the kinds of challenges historical populations faced in the past (Lewis 2007).

This thesis is a comparison of two contextually distinct historical cemeteries found in the state of Wisconsin: The Saints (Ss.) Peter and Paul Parish Cemetery and the Milwaukee County Poor Farm Cemetery (MCPFC). Both cemeteries were in use at approximately the same time

during the late 19th and early 20th centuries. However, these two cemeteries served very different constituencies. The Ss. Peter and Paul Parish Cemetery is a community-based institution that served a population of Roman Catholic Polish farmers in the city of Independence found in west-central Wisconsin. On the other hand, the MCPFC, located on the Milwaukee County Institutional Grounds in Wauwatosa of southeastern Wisconsin and functioning within the context of a rapidly expanding and industrializing city of Milwaukee, became the final resting place of several diverse populations: the community poor; residents of the various country institutions; and the victims of suicide, murder, violent accidents, other unidentified individuals, and those without kin (see Richards 1997). The majority of juveniles interred within the MCPFC were abandoned and of unknown origin or were aborted fetuses, while children interred in the parish cemetery come from an altogether different set of circumstances: that of the community-based agrarian family unit.

The research goals for this thesis are as follows:

1) The first goal is to provide an age, sex, and pathological profile for the individuals excavated from the Ss. Peter and Paul cemetery in 2015. The author conducted the analysis under the supervision of Dr. Robert Jeske (see Jeske and Strange 2016; Watson et al. 2017).
2) The second goal is to compare these data with that of the MCIG population as reported by Richards et al. 2016. The very different set of cultural circumstances surrounding these two cemetery populations suggests that we may be able to observe significant variation between the two groups.

History of Historic Cemeteries

Sloane (1991) argues that the vast diversity of burial customs in the United states can best be described as a mosaic of practices. There are more than 100,000 European-style burial repositories nationally, and these are the result of the hopes, dreams, and tragedies of over three centuries worth of European colonization, immigration, and subsequent settlement in concordance with the advancing frontier all the way through to modern times. Several authors note, in broad strokes, the manner in which graveyard and cemetery practices have progressed from pioneer cemeteries, through to community and church heartland-type cemeteries, and on to rural or garden cemeteries, and then finally through to forest-lawn cemeteries and memorial grounds in modern times (Bell 1990, Dilley 2014, Mytum 2004, Sloane 1991). Other typological descriptions exist but refer to these time periods as the pioneer, Victorian, conservative, and modern periods (Francaviglia 1971:507). Furthermore, the time periods of the various typological schemes are not quite in agreement. Consequently, it is often difficult to place a given historic cemetery neatly into these typologies; it is often the case that the literature either focuses on one particular region within the United States (cf. Dilley 2014, e.g. Francaviglia 1971, Sloane 1991), or does not perform a satisfactory job in describing the differential rates that different practices reach different parts of the country (e.g. Mytum 2004).

Despite these apparent difficulties, the typological timelines presented by these authors do have heuristic value in the attempt to characterize a particular cemetery or graveyard. The fit may not be perfect, but if we view these typological classifications as a continuum rather than discrete categories based upon defined time periods it is indeed possible to generally place most cemeteries within the mosaic pattern described by these authors. It is through the recognition of technology, business practices, demographics, cultural norms, social relationships, and material

culture that we are able to place cemeteries within the mosaic at their particular time and place of use (Sloane 1991:1).

The history and evolution of the historic cemetery can be traced all the way back to the colonial period (circa AD 1500-1700). Beginning in this period and all the way up until the early 19th century, the interment of the dead occurred in four different types of contexts: Pioneer, domestic, churchyard, and potter's field (Sloane 1991:13-25). The earliest pioneer burial grounds were likely influenced by a combination of European heritage and day to day life. Protestants rejected the Catholic mandate of burial on consecrated ground, and that attitude came with the first wave of colonists seeking religious freedom (Dilley 2014:5). They were likely the result of an individual's death and subsequent burial, oftentimes in an area remote from settlements. Subsequent burials were then arranged around the original one. These types of burial grounds were typically either unmarked, marked with vegetation, or marked with some alternative impermanent memorial material (e.g. made of wood) (Dilley 2014, Kiest 1993, Roller 2016:13, Sloane 1991:14).

The family graveyard, often situated on or adjacent to a family farm, arose as population densities rose and the lonely pioneer graves disappeared (Sloane 1991). Families living on nearby farms often consolidated their burials with extant burial grounds already in use (Mytum 2004:18). These plots were deliberately well-kept, and these small graveyards may have served as symbols of domestication and civilization in juxtaposition with the dangerous and difficult nature of pioneer and colonial life. These domestic graveyards were typically placed on the outskirts of a field with a couple trees nearby to provide shade. They tend to be characterized by irregularly placed markers within the small fenced enclosures, and the graves of children often disturbed once orderly rows because of the smaller size of the grave (Sloane 1991).

The community graveyard is the third context in which Americans disposed of the dead during this period, and they typically were located adjacent to a church or meeting hall within town (Mytum 2004, Sloane 1991). The practice of placing these graveyards near the meeting hall is more common in New England, and wherever Protestant values were a prominent driving cultural force. Initially, the New England tradition placed the graveyards well away from the living, but the practice of placing them closer to the central meeting hall became more popular in beginning in the late 17th century (Dilley 2014, Mytum 2004). The church graveyard was an idea carried over from Europe where the practice was still popular and increasing numbers of immigrants from Protestant, Catholic, and Jewish faiths brought the idea with them overseas (Sloane 1991:19-20).

The final form that a graveyard might take during this period is that of the potter's field (Sloane 1991:25). These types of graveyards were few in number during this time period and they were reserved for the indigent. The term applies to anyone unable to purchase a grave or a vault, but also to slaves who were typically given their own burial grounds, or even strangers that happen to be within the community. These community cemeteries that were already in place typically contained areas set aside for the poor, downtrodden, and also the unidentified, but communities that did not set aside additional spaces. Pauper burials are typically sparsely marked. Few of these types of burial grounds in the early historic period remained in use for very long and many were lost to time and development (Mytum 2004, Sloane 1991).

The late 18th and early 19th centuries brought great change to the funeral industry, leading to increasing levels of commercialization and differential trends (Dilley 2014, Mytum 2004:43, Roller 2016). These changes in mortuary behavior are correspondent to great changes in the substance and appearance of American urban environments which, in turn, are a reflection of

changes in the lives and thoughts of their inhabitants (Dilley 2014:6). Mytum (2004) identifies three different trajectories of cemetery use during this time. Those families and settlements still located near the frontier were still employing unmarked pioneer plots and graveyards in order to dispose of the dead. Rural areas tended to employ the farmstead burial scheme, while increasing populations in urban contexts began to formalize lasting cemeteries that were often away from town centers. The beginnings of the Industrial Revolution (circa late 17th century), however, helped catalyze perhaps the greatest and most noticeable changes in the cemetery's cultural trajectory—changes that were happening in America's rising urban centers (Dilley 2014, Mytum 2004, Roller 2016, Sloane 1991).

The development of increasing numbers of settlements and the evolution of others coinciding with the Industrial Revolution and the high numbers of immigrants flooding into American cities brought sweeping changes to the urban landscape. Cities, such as Milwaukee and Chicago in the Midwest, were receiving every increasing numbers of immigrants and others as populations spread west through the heartland of America (Leavitt 1996). Increasing populations led to unsanitary living conditions and increasing incidences of disease. Graveyards, which were typically left unattended, became unsightly, overcrowded, and altogether unhealthy. Increasingly more common incidences of poorly understood infectious diseases such as typhoid, cholera, yellow fever, and influenza only added to the stresses on daily life and the way that these urban burial spaces were viewed. People began to associate cemeteries with sickness and disease rather than as repositories for deceased loved ones (Dilley 2014).

Circa AD 1800-1850, Cemeteries within city limits were closed off to additional burial, and a new type of cemetery began to show up on the landscape: The rural garden cemetery (Dilley 2014, Mytum 2004, Roller 2016, Sloane 1991). A major innovation of the garden

cemetery was its removal from densely populated areas. These cemeteries started to become increasingly secular in nature. They tended be placed in areas devoid of church control. Cemetery structures began to change from an organically expanding area predicated on the death of additional individuals to having a central plan, favoring picturesque and romantic environments, coinciding with the rise of popular opinion toward the Victorian notion of the beautification of death. The commercialization of death is also seen during this transition to the use of these types of cemeteries (Dilley 2014, Mytum 2004, Sloane 1991). As such, cemeteries typically were managed by either public or private entities, and plots were sold off at increasing costs to individuals, families, and associations. Furthermore, it is in this type of cemetery that we begin to see distinct sections reserved for children. Seemingly in opposition to this commerciality, garden cemeteries often provided space for the sudden and often unexpected death of children families may not have had the time or opportunity to plan or pay for (Sloane 1991).

The middle of the 19th century ushered in a new style of cemetery. The new park-lawn cemetery is characterized by increasingly levels of organization in terms of design and appearance on the landscape (Roller 2016, Sloane 1991). Sprawling pastoral lawn landscapes replaced the picturesque groupings of trees. Cemeteries became more park-like; monuments and memorials became more formalized and standardized. It was the artful minimalist character of the landscape that would become more obvious and more celebrated (Sloane 1991:107). The entire concept of the park-lawn cemetery is rooted in a period of American history conceived of policies of continual expansion and reform (Sloane 1991:112). Changes in American ideology during the last half of the 19th century proved to polarizing. In some regions, the idea of the park-lawn cemetery was reinforced and popularized as it became symbolic of pride of one’s city and

yet also of their fear of its impact on moral values. Yet other social processes, such as more recent waves of immigration, led to the development of some communities that were resistant to the consistent Americanization of values (Kiest 1993, Sloane 1991:112). Ideas surrounding the park-lawn cemetery tended to become more popular with native-born Americans, while communities of immigrants tended to be more resistant to these ideas. Communities comprising mainly immigrants tended to prefer the less garden-like burial places of the old world. These burial grounds served as departure from the mainstream distinctly "American" cemetery trends and represent one of the ways that these communities were able to engage in resistance to American adaptations (Kiest 1993, Sloane 1991:112). The differences in values, meaning, and relationships between homogeneous immigrant communities and urban, more heterogeneous communities were reflected in cemetery organization (Sloane 1991:113).

Chapter 2- Historical Context and Project History

The United States experienced substantial waves of population growth in the decades following the Civil War as many Europeans, unsatisfied with their living conditions in Europe, sought new lives and new opportunities through emigration into the United States. Between 1840 and 1850, approximately 4 million Europeans had already entered the country. This number would jump to over 10 million over the following thirty years (Dougherty 2011:1). Trempealeau County, formally organized in 1854 through an act of the Wisconsin Legislature from lands formerly included in Buffalo, Jackson, and La Crosse counties. The county was established at a time roughly coincident with multiple waves of German and Polish immigrations into Wisconsin as a result of a combination of social and economic conditions in Europe (Watson et al. 2017, Leavitt 1996).

Polish immigration into the United States occurred broadly in three stages: the colonial period (1608-1830); a period of political emigration (1830-1850), and then a period of economic emigration (1850-1939) (Watson et al. 2017, Zawacki 1984). Specifically, this final period of Polish economic emigration refers to the period during which scarcity of land available to rural Polish families, prompting many to leave in search of inexpensive, available land and better work compensation. Many of these Polish immigrants hailed from Prussian-occupied areas. Wisconsin was a popular destination for these particular groups because many of them spoke German in addition to English, which served to ease their settlement among Wisconsin's already large German population. Poles from the Prussian regions of Posen, West Prussia, and Silesia accounted for roughly 80% of the Polish immigrants heading into Wisconsin. As such, these groups exhibited a high level of cultural homogeneity (Mikos 2012, Watson et al. 2017).

Polish groups settled in Trempealeau County beginning in the winter of 1862-1863 (Mikos 2012, Watson et al. 2017). Polish families were primarily in search of abundant, inexpensive land suitable for agriculture, and Trempealeau County was among three main hot spots of settlement; the other two areas are located in the northeast portion of the state in Brown, Oconto, and Shawano counties, and in the central portion of the state in Portage and Marathon Counties. The town of Independence was founded in 1876 and takes its name from the United States centennial celebration of that year (Roller 2016). The site was chosen due to its location between Elk Creek and Travis Creek. The township of Independence was incorporated in 1885, and was later organized into a city in 1942.

The majority of Poles who settled in Wisconsin during the 19th century practiced Roman Catholicism. As in Poland, the church was a central component of village life in Independence, and the Polish parish was typically considered the center of the community in the Wisconsin (Watson et al. 2017). Polish immigrants shaped their identities centered around the parish, often constructing magnificent churches that stood both as a symbol of their devotion and source of pride. The parish, unsurprisingly, also assumed the primary role of educating children of the community. Nearly all of these Polish parishes in the state had an affiliated elementary school that provided Polish children with a standard curriculum; furthermore, these institutions also played a large role in maintaining the use of the Polish language and the passing along of traditional Polish values. The community of Independence followed this pattern (Watson et al. 2017:2-7).

Beginning circa 1869, congregational services were held in the home of one Peter Sura. Sura, along with Lawrence Bautsch, is credited with recruiting Polish families from the areas surrounding Arcadia and Independence, many of which hailed from the Popielow region of

Poland (Watson et al. 2017, Roller 2016, Gammroth 1976, Saints Peter and Paul Congregation 1975). The first formal burial of a parishioner is reported by Roller (2016:21) to have occurred in 1872. By 1875, the first Ss. Peter and Paul church was constructed, taking the form of a small, white, frame structure (Figure 2.1) dedicated by Bishop Michael Heiss, Diocese of La Crosse. This founding structure was eventually replaced by an imposing red brick Neo-Gothic Revival-style church. Reportedly, this later construction had been modeled after a church in Popielow. The Ss. Peter and Paul parish today represents one of the largest congregations in the La Crosse Diocese and remains a central component of the Polish community of Independence, Wisconsin. Historical records indicate that the cemetery itself was in use between roughly 1872-1930. Roller's (2016:85) analysis of coffin hardware and material culture indicates that the archaeological record of the cemetery fits within that expected range.

Milwaukee Immigrants and the MCPFC

European emigration into the United States and, more specifically, Milwaukee County was motivated by factors similar to those families moving further west into rural areas. Individuals were also motivated by religious reasons, but more so for economic purposes (Dougherty 2011, Diner 1998). Instead of family units seeking fertile and affordable farmland, immigrants coming to the industrializing centers of the Midwest such as Chicago and Milwaukee were usually young males seeking to create economic opportunities with the intent of either returning home or bringing their families across the Atlantic Ocean at a later time. America was thought of as a land of opportunity, and these immigrants stood able and ready to meet the economic challenges that awaited them. The waves of migrations into Milwaukee resulted in a very heterogeneous mix of ethnicities and backgrounds. Leading among these groups were those

of German and Polish descent; however, immigrants of Irish, Italian, Russian, Greek, and others were also included within the social and cultural milieu (Leavitt 1996, Richards et al. 2016). Figure 2.1 provides census data (1890-1920) indicating country of birth for individuals in the city of Milwaukee.

Urban life in Milwaukee, within the swirling context of rapid industrialization and population growth, led to increasing levels of health problems which, in turn, led to poverty. Recognition of these problems within this expanding urban environment led to the recognition on the part of the state government and associated agencies for those impacted by these issues (Richards et al. 2016, Richards and Kastell 1993). The message left here, in between the lines, is that poverty, sickness, and disability were life characteristics acquired, in large part, after coming to America (Dougherty 2011).

Country	1890	1900	1910	1920
Germany	27	19	17	8.7
Poland	4.5	6	_	5
Ireland	1.7	0.93	0.52	0.31
Britain	1.7	0.1	0.72	0.61
Norway	0.89	0.6	0.57	0.40
Bohemia	0.71	0.6	_	_
British America	0.61	0.66	0.5	0.45
Austria	0.45	0.57	3	1.2
Holland	0.34	_	_	_
Switzerland	0.29	0.23	0.22	_
Italy	_	0.25	0.9	0.88
Russia	_	0.4	3.2	1.6
Hungary	_	_	1.4	1
Greece	_	_	0.29	0.4
Czechoslovakia	_	_	_	0.98

Figure 2.1: Percentage of Milwaukee Residents by Country of Birth, from the U.S. Census of 1890-1920 (Richards et al. 2017)

Wisconsin legislation regarding relief for the poor was drafted in 1849. County supervisors were given the authority to purchase a poor farm and associated facilities to which

the poor of the county “may be removed” (Richards et al. 2016). By 1852, Milwaukee County legislators added a school located in a small frame house next to the main building. The poor, the sick, the orphans, and even the mentally or emotionally disabled were sharing the same living quarters during these initial stages. In 1860, a county hospital was constructed to provide the sick poor some degree of medical treatment. The increasing costs associated with this additional facility and services, of course, led to increasing taxes and taxpayer complaints. The County Board ruled in 1861 that “all adult paupers shall labor and that minors shall be indentured” (Richards and Kastell 1993). It was not until around the turn of the century that all the Milwaukee County institutions were completely established. These facilities included a school and orphanage for children, in addition to the existing almshouse and hospital (Richards 1997, Richards and Kastell 1993, Richards et al. 2017).

Expectations Between Burial Populations

Armelagos and Van Gerven (2003:53) famously states that “human skeletons represent answers, and the goal of osteology is to frame the questions.” They follow this deceptively complex statement by noting that there are important questions that skeletons will not answer and, conversely, unimportant questions that they will answer. It follows that bioarchaeology must employ a biocultural approach not only to obtain answers about past populations, but also to properly frame the questions we ask. Biocultural approaches to the study of variation found in ancient skeletons occur at the intersection of the human body and both the cultural and natural environments within which the individual resides. Bioarchaeology, of course, being a subdiscipline of archaeology is rooted in the contextualization of biology, behavior and the environment (Agarwal 2016, Armelagos and Van Gerven 2003, Larsen 1995, 1997, 2002). It

remains the case that skeletal remains represent the most direct link available to the archaeologist to the health, well-being, dietary history, lifestyle, ancestry, and other key biological aspects (i.e. age and sex) utilized to construct demographic profiles of the populations from which they originate (Agarwal 2016, Armelagos and Van Gerven 2003, Larsen 1995, 1997, 2002, Larsen and Ruff 2011, Walker 2001).

Investigations into the bioarchaeology of subadults within populations is a more recent convention (Halcrow and Tayles 2008). Buikstra and Cook (1980) argued that bioarchaeological studies focused on subadult human remains had been floundering due to issues such as poor preservation, small sample sizes, and lack of overall recovery compared with adults (Halcrow and Tayles 2008, Lewis 2007). By the 1990s, the prevalence of stress indicators in subadult populations became more popular as researchers became more encouraged by the increase in availability of subadult skeletal material (Lewis 2007, see Stuart-Macadam 1991). The prevalence of stress indicators in subadult skeletons was becoming more popular; researchers were beginning to emphasize the impact of nutrition, agriculture, colonization, migration, and urbanization on childhood health (Lewis 2007).

A general model for the study of stress in skeletal populations is presented in Figure 2.2 (Goodman and Armelagos 1989:226). The model holds that the environment is not only the cause of adverse stressors but also provides resources necessary for survival. The process of extracting necessary materials from the environment is mediated through the cultural system. Cultural systems have the innate ability to act as a stress-buffer for the individual and at the population level (e.g. using clothing to mitigate the effects of cold weather) (Armelagos 2003, Goodman and Armelagos 1989). However, not all stressors may be buffered and the cultural system also can generate significant stressors. Unbuffered stressors generated by the

environment or cultural system are then left to individual biological resistances. Physiological disruptions may then have consequences for the overall population. It is expected that stress disruptions will then manifest themselves skeletally, provided the individual is alive long enough for skeletal indicators to develop (Armelagos 2003, Larsen 1997, 2002, Lewis 2007,).

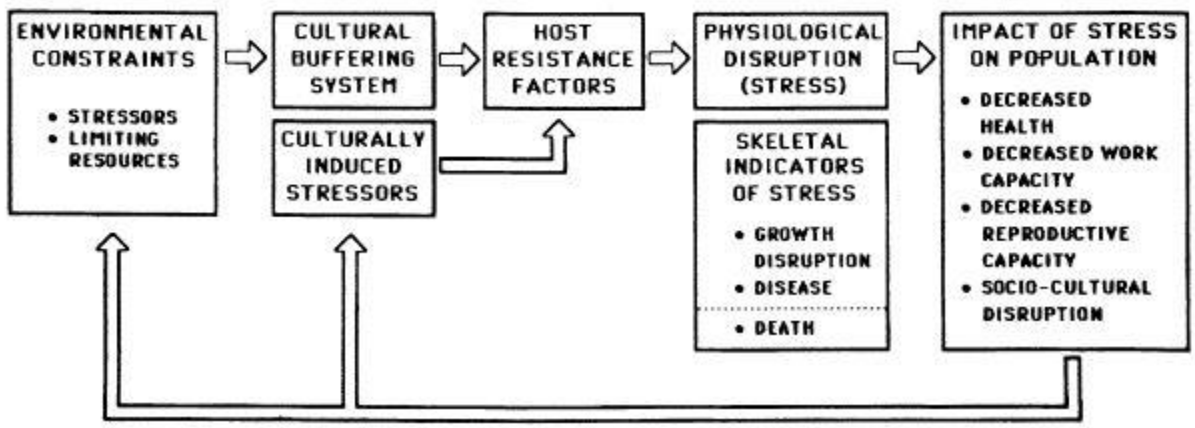

Figure 2.2: Model of Skeletal Stress Indicators (Goodman and Armelagos 1989)

Goodman and Armelagos (1989) argue that children aged under five represent the most vulnerable members of a population to cultural and environmental insults. The stress experienced by subadult populations, particularly of those of toddler age or under, should significantly impact the overall population's ability to withstand disease through to adulthood. Modern studies on the growth of children from disparate populations, social backgrounds, and environmental context have indicated that growth is significantly affected by adaptive concerns. Lewis (2007:66) argues that children are most vulnerable to growth issues during the prenatal period, followed by the period between birth and age six. Regardless, it is clear that earlier demographic age categories seem to be at greater risk. Perhaps the biggest challenges present within an osteological analysis of children has to do with the specific relationship between disease and the juvenile skeleton with regards to the sample as representative of the non-survivors of a given a population (Lewis

2007). Patterns observed in terms of growth rates or frequency of pathological lesions may not reflect that of the children that did survive into adulthood (Lewis 2007, Wood et al. 1992). Moreover, chronic diseases need to time to manifest on the skeleton in any observable manner, while acute infections or disease have a high potential to kill before any such lesions are imposed (Lewis 2007).

The measurement and interpretation of differences in the level of health in skeletal populations are vital to our understanding of how the adaptive success of human populations has varied across space and through time (Wood et al. 1992). The attempt to assess the health status of subadults is largely predicated on growth data coupled with evidence of disease and nutritional stress (Lewis 2007:68, Armelagos 2003). Both the Ss. Peter and Paul Parish cemetery and the MCPFC skeletal populations contain a large subadult segment, providing a rare opportunity to answer these types of questions (see Jeske and Strange 2017, Richards et al. 2016, Watson et al. 2017).

Critically, the Ss. Peter and Paul cemetery and MCPFC each represent a very different combination of cultural, social, and environmental factors. The Ss. Peter and Paul Parish sample is rural and ethnically homogeneous, while the MCPFC sample is urban and heterogeneous. Since the inhabitants of the communities lived very different lives, a comparison between the two skeletal samples should present significantly different patterns in terms of general health and indicators of stress. This type of analysis has long been undertaken by scholars operating in Britain (e.g. Fleming 1993, Lewis 1995, Lewis 1999, Lewis 2002, Lewis et al 1995, Pitts and Griffin 2012, Redfern et al 2015) and it is the case that significant differences are identified between rural and urban populations. Redfern and colleagues (2015) found that rural populations during the Roman period in Dorset experienced lower frequencies of indicators of

stress, dental defects, and metabolic deficiencies. However, Pitts and Griffin (2012) found in their own study of Late Romano-British cemeteries that rural populations were actually less healthy than their urban counterparts, contra historical models stressing the disadvantages of urban environments. However, in most cases the urban population, particularly as industrialization was sweeping the western world, prove to be the healthier group and were afflicted by less adverse risk factors. Lewis (1999, 2002) also found significant differences between rural and urban populations in her study of four sites from the medieval and postmedieval periods of England. Similarly, Lewis and colleagues (1995) identified risk factors associated with industrialization as the primary mechanism of greater incidences of sinusitis observed upon skeletons in an industrializing late medieval period British settlement.

With these caveats in mind, I expect to see indications of a healthier population in the rural, homogenous population of the SPPC compared to the urban, poor, heterogeneous population in the MCPFC. Specifically, long bone length at age-of-death is compared between the two samples, and comparisons of pathology rate and type at age-of-death is considered as indicators of overall nutritional stress and disease susceptibility. My expectations are two-fold:

1. It is expected that the subadult individuals at the MCPFC will be found demonstrably more pathological than the subadults at the Ss. Peter and Paul Parish cemetery in terms of indicators of nutritional stress and non-specific osteolytic and osteoblastic lesions.

2. It is expected that subadults at the Ss. Peter and Paul Parish cemetery will be demonstrably larger than subadults from the MCPFC in terms of growth rates relative to age estimation.

Project History

Located in west-central Wisconsin just north of Independence, Wisconsin in Trempealeau County, the Saints Peter and Paul Parish Cemetery (BTR0024) is an uncatalogued cemetery that first became the focus of a cultural resource management endeavor conducted by Commonwealth Heritage Group, then known as Commonwealth Cultural Resource Group, in 2010 (Figure 2.3). The cemetery is affiliated with the Saints Peter and Paul Catholic Church.

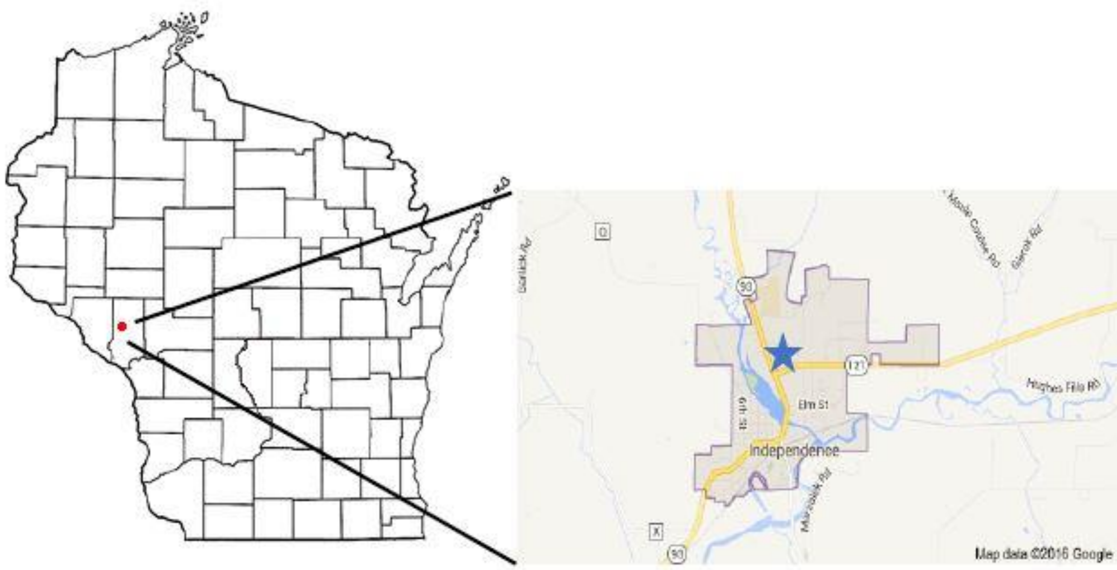

Figure 2.3: Location of Independence, WI (adapted from Roller 2016)

Commonwealth Heritage Group began involvement with the parish as result of the proposed reconstruction of State Highway 93 and concerns of the parish constituency with regards to the possibility that the highway project would negatively impact unmarked graves that may be located near highway right-of way. Investigations at that time revealed no known graves within the STH93 right-of-way, and located graves nearby were recorded (Watson 2011, Roller 2016, Watson et al. 2017)

Commonwealth began the background research and documentation process in 2011 as required was required in the beginning stages of the STH 93 investigations (Watson et al. 2017).

During this process, several key members of the Ss. Peter and Paul Parish were interviewed, including cemetery sexton Ms. Naomi Wiersgalla, church secretary Ms. Cherrie Miller, priest in residence Reverend David Kunz, and funeral director Mr. Keith Edison. During the interviews, it was revealed that these individuals anticipated that there were unmarked burials on the church property. Specifically, areas in which there may have been a high potential for hidden burials include the area southwest of the front of the church (Figure 2.4), between the row of marked graves and the sidewalk along the east side of STH 93 (Figure 2.5), and also possibly in the area northwest of the church, between the church and the parking lot. Finally, several long-time members of the parish recall seeing headstones in the vicinity of two large maple trees in the

Figure 2.4: Overview of Ss. Peter and Paul Cemetery along Hwy 93, View Southwest (adapted from Watson et al 2016)

grassy area between the church and the parking lot.

In 2011, Dan Reid of the Wisconsin Department of Transportation (WisDOT) Bureau of Technical services (BTS) conducted a ground-penetrating radar (GPR) survey with an eye toward determining whether unmarked burials were present in the STH 93 right-of-way (Reid 2011, Roller 2016, Watson et al. 2017). Several unknown anomalies were discovered as a result of the survey which, based upon their locations and depths, were assumed to represent unmarked burials. Some anomalies were identified southwest of the church, approximately 8 to 33 feet (2.5

to 10 meters) east of the sidewalk paralleling STH 93 but outside of the right-of-way. Additional anomalies were identified northwest of the church in a grassy area circumscribed by the sidewalk paralleling STH 93, the church parking lot, and a walkway leading from the parking lot to the church.

Evidence produced through GPR does not in and of itself provide sufficient proof of the presence or absence of subsurface features. Subsequently, WisDOT contracted Commonwealth

Figure 2.5: Overview of Ss. Peter and Paul Parish, view south. Pictured in Watson et al. 2017.

Heritage Group to conduct subsurface testing within the STH reconstruction project in order to ground truth, or physically confirm, the GPR results. Some interesting results were obtained, including a masonry wall, but no burials were observed during this testing (Watson 2011, Watson et al. 2017).

In 2013, the Ss. Peter and Paul Parish wished to investigate options for installing a barrier-free access into the church structure. The possibility of disturbing unmarked graves was still a concern. Commonwealth was again asked to investigate the area next to the church and later expanded the study area to include an area to the northeast of the rectory garage (Roller 2016, Watson et al. 2017). The goals of this study were to identify and document any potential

unmarked graves within the study area as well as to collect any additional information that may provide insight into the age of the graves and who might be interred within them.

A total of 124 grave shafts were located during the 2013 investigations. The only cultural materials recovered while locating the grave shafts were displaced headstones in the soil fill above the grave shafts themselves (Kaufman 2014, Watson et al. 2017,). Most of these markers were removed from the disturbed soil fill, as they were no longer *in situ*. Others were left in place as they appear to have been left relatively close in place to what may have been their original locations. It appears the justification for these markers left in place is that they were much larger and would have been difficult to displace. The removed markers were returned to the church in order to help facilitate identification of the individuals interred in the area.

Commonwealth met with parish members in November of 2013 in an attempt to obtain information about identities of individuals that may be interred in these unmarked graves. Individuals attending this meeting did have some memory of the north side of the cemetery regarding the identity of individuals and the meeting resulted in a compilation of information regarding individuals who had funerals at the parish but were not represented on extant headstones, along with a partial list of priests who may have presided over said funerals. Excavations of human remains began in September of 2015 to July of 2016 (Watson et al. 2017). Importantly, the support and interest in these unmarked graves by the parent community cannot be understated in relation to this project.

Chapter 3: Saints Peter and Paul Osteological Analysis

Commonwealth Heritage Group field crews excavated 104 archaeologically distinct features (Figure 3.1) and recovered 108 human skeletons. Two of these features were of the non-burial variety, one of which did contain human remains. The remaining 102 features are classified as formal burials. The skeletal materials excavated from the Ss. Peter and Paul Parish cemetery were analyzed by the author under the supervision of Dr. Robert Jeske.

Generally speaking, the remains recovered were in poor to very poor condition. Most individuals were represented by relatively few bones. Bones that were present were often severely weathered or damaged by roots and other inherent taphonomic processes that occur after interment. Cranial bones and vertebrae tended to survive better than infracranial and most other postcranial elements. The initial analysis (Jeske and Strange 2017) indicates that this area of the cemetery represents an anomalous portion of the overall cemetery, owing to the high proportion of subadult individuals.

Analytic methods for examination of the human remains follow the *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994). This volume represents the baseline recoding and analysis techniques for mainstream archaeology and bioarchaeology in the United States. Several other reference guides were utilized as an aid to our analysis and interpretations. These include (Baker et al 2005, Bass 2005, Krogman and Iscan 1986, Mays 2010, Scheuer et al 2000, Steele and Bramblett 1988, White and Folkens 2005). It must be stressed that the taphonomic effects upon bone condition, including missing elements, weathering and erosion of bone, and other factors such as bioturbation, made the assessment and estimation of age, sex, and pathology provisional or, in some cases, impossible. It follows, then, that a conservative approach towards identification was followed as a result of these issues. Age,

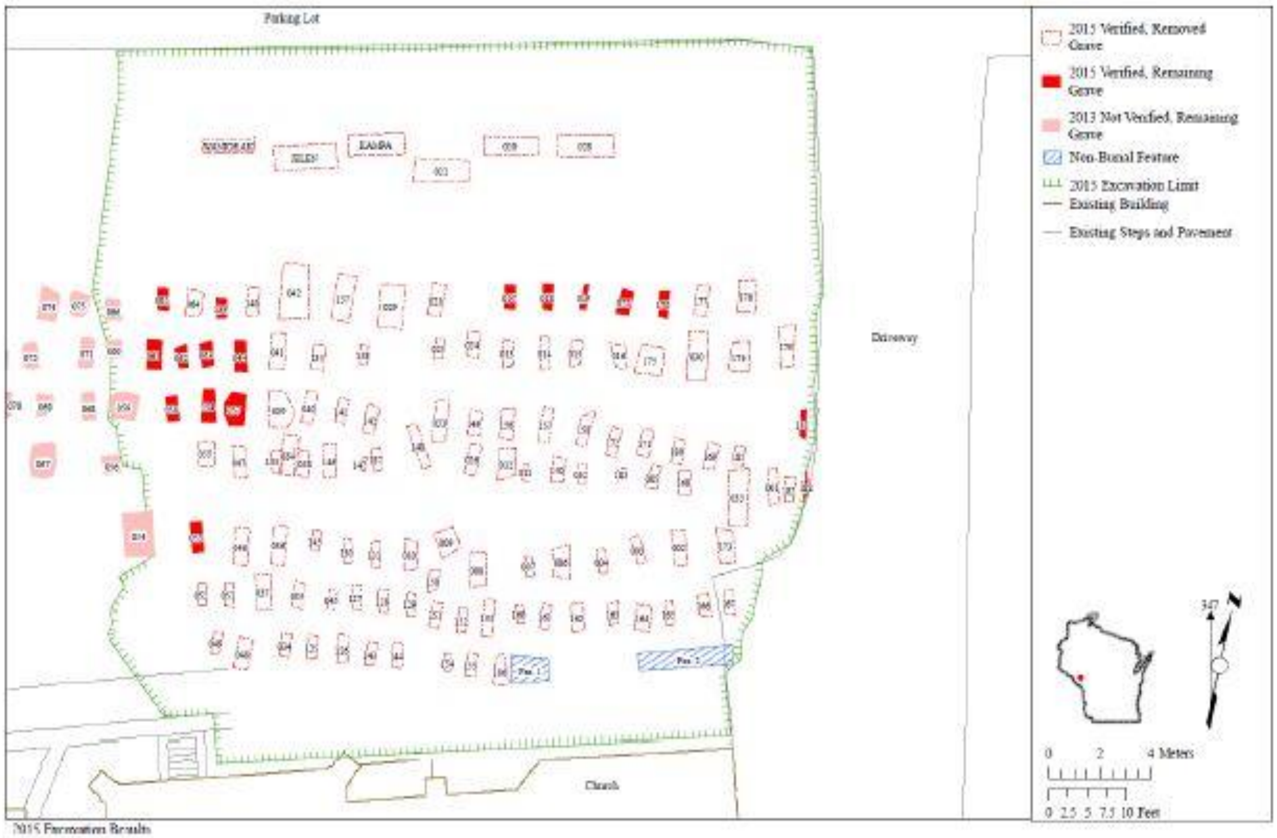

Figure 3.1: Map of Excavated Burials (adapted from Watson, et al. 2017)

sex, and pathologies are reported in a manner consistent with high accuracy, meaning that interpretive categories will tend to be broad, rather than narrow, thus ensuring that results would most likely be replicable. As such, estimation of sex was not conducted on subadult remains due to the inherent inconsistency related to the lack of sexually definable variables that are much more robust when employed in the analysis of mature remains. Similarly, stature determination was only attempted for adults.

The goals of the initial analysis (Jeske and Strange 2017), where feasible, for all excavated individuals include:

1) Determining age at death. Age at death is reported in two ways. The first age at death is a modified typology based on Ubelaker and Buikstra (1994:9).

Fetal (< birth)

Infant-Perinate (birth-6 months)

Infant (6 months-3 years)

Child (3-12 years)

Juvenile (12-20 years)

Adolescent (15-19 years)

Young Adult (20-34 years)

Middle Adult (35-49 years)

Old Adult (50+ years)

The second manner in which age-at-death is reported is through providing an estimated age in years. These estimates may be reported with (e.g., 3 years ± 12 months) or without an error term (e.g. approximately 6 months) dependent upon which methods we were or were not able to utilize when producing the estimate. In most cases, this second method of reporting will be more precise, though perhaps at the cost of accuracy. It should also be noted that the term 'perinate' has been added as a subadult age category when enough evidence is present to infer that the age of death was within 6 months of live birth at the greatest extent of error estimation. The Ubelaker and Buikstra age scheme utilizes the category of 'infant' (birth-5 years), which is too broad a category based upon the data collected in some cases.

In all cases, age at death estimates are based on a combination of dental development and tooth eruption, bone union, and long bone measurements as detailed and/or discussed in (Agarwal 2016, Baker et al 2005, Chitty and Altman 2002, Humphrey 2000, Huxley 2010, Kent et al 1978, Konigsberg et al 2015, Phillips and Van Wyk Kotze 2009, Maresh 1943, 1955, Meindle and Lovejoy 1985, Melson 1969, Moorees 1965, Moorees et al 1963, Primeau et al

2016, Scheuer and Black 2000, Scheuer et al 2000, Ubelaker 1989, 2010). While it is true that not all methods are appropriate for all age categories, and many individuals lacked the appropriate bones present for some measurements or methods; however, appropriate caveats and nuances were considered (e.g. Nawrocki 2010, Phillips and van Wyk Kotze 2009, Smith 2010).

Maresh's (1943, 1955) bone length measurements for subadults provided results that were consistently and, in many cases, significantly younger than the dental and bone union evidence. However, the quadratic equations provided by Primeau and others (2016) provided results that were more consistent. A comparison between the two methods indicated that while the Maresh method appeared to be out-of-sync with our other lines of evidence, the Primeau method, when applicable, lined up in a much more satisfactory fashion. The most likely reason for the disparity between the Maresh tables and the rest of our data is that Maresh's fetal samples were based upon live bone radiographs. It follows that when one compares a dry bone measurement to live bone radiographs, taphonomic attrition of the bone will result in the production of an age incommensurate with other lines of evidence. In lieu of Maresh's tables, the quadratic equations produced by Primeau at al 2016) were utilized as the primary means of calculating age from long bone measurements among subadults. The only caveat in terms of the utilization of these quadratic equations is that they allow for a relatively large standard deviation. As a result, precision is sacrificed in favor of accuracy. However, when utilized to complement other lines of evidence it is quite clear that this method is much more useful than Maresh's tables in most circumstances.

2) Determining biological sex of adult individuals. Biological sex was determined for adults only, given the inherent uncertainties of sexing non-sexually mature individuals (Ubelaker and Buikstra 1994).

3**) Determining the evidence for any pathological conditions or trauma on the bones.**

Pathological assessments were carried out utilizing comparative illustrations and descriptions from several sources, including online resources (e.g. (Burt, et al. 2013, Collins 2010, 2011, Jardine 2011, Lewis 2000, Lewis 2007, Mann and Hunt 2005, Roberts and Manchester 1997, Symes, et al. 2015, Waldron 2009, White and Folkens 2000). Online resources include: http://www.pathology.vcu.edu/paleo/a_contents_table.html, http://archive.museumoflondon.org.uk/Centre-for-Human-Bioarchaeology/Resources/Photographs/lowerstbrides1.htm and http://www.pathguy.com/lectures/bones.htm.

The approach to the discussion of pathology is purely descriptive. That is, no attempt was initially made to identify differential diagnoses on a case-by-case basis due to the inherent uncertainty of making diagnoses under even the best conditions, let alone taphonomically compromised skeletal remains (Waldron 2009:9). Correspondingly, it is strongly cautioned that the relatively spongy nature of fetal and perinatal bone development may make any pathological identifications precarious (Lewis 2000:42-44). For example, gray woven bone noted on juvenile cranial elements may or may not be pathological (c.f. Jankauskas and Schultz 1995). Regardless, it has also been demonstrated that both solitary and multiple lesions on fetal and infant bones are not unusual utilizing imaging techniques. As such, these lesions should also be recognizable in dry bone. For example, disorders such as cranial fasciitis can manifest lesions in reactive bone that should be observable when present (Yébenes et al. 2007).

The problematic nature inherent in pathology analyses on subadult skeletons necessitates the adherence to strictly conservative approach to the identification of pathological lesions. Nevertheless, several authors note that successful bioarchaeological analysis of this type of

sample are well within the realm of possibility (e.g. Collins 2010, 2011, Jankauskas and Schultz 1995, Jardine 2011, Kelley and Eisenberg 1987, Mays et al 2006). In some cases, plausible or even obvious causes may be suggested, but it is crucial to note that these claims are not definitive in terms of the causes of any noted pathologies.

4) Determining taphonomy. Taphonomy is a subdiscipline that is defined as the "investigation of processes that affect an organism from its death until the point at which its study commences," (Buikstra and Ubelaker, 1994:95). The category as it is utilized within this analysis refers simply to the description of the bone based upon observed characteristics reflected in the color, surface detail, and shape, abnormalities present.

A few more brief notes: A full description of the archaeological context can be found in the CRM report produced by Commonwealth Heritage Group (Watson et al 2017). The description and analysis of the recovered material culture can also be found in that report, but a more detailed and comprehensive analysis may be found in Amanda Roller's (2016) master's thesis. The identification of these burials as culturally Polish Euroamerican, unless otherwise noted, is owing to the continued use of the cemetery by the community up until the time of excavation (and beyond).

All analysis was conducted at a secure room at Commonwealth Heritage, Inc., Brown Deer facility. Identification and measurement of variables were made with the aid of low level (10-20x) magnification, calipers, spreading calipers, fabric tape measures, bone boards, and other standard equipment. No destructive analysis was conducted (e.g., chemical tests, isotopic analysis, DNA). It should also be noted that field notes, maps, and photographs of the fieldwork were consulted in order to facilitate and aid interpretations.

A summary of burials and individuals is reflected in Table 3.1. Individual burial descriptions can be found in Appendix A, Strange and Jeske (2017), or Watson et al (2017). The burial descriptions each list burial context, skeletal inventory, general preservation, sex (where possible), estimated age (where possible), cultural affiliation, any noted pathologies, and a general summary. In some cases, photographs of notable elements are included. All photographs of individuals can be found in the Appendix.

Table 3.1. Basic Inventory of the Excavated Burials and Individuals.

Burial	**Individual**	**Age at Death**	**Pathology**	**Sex**
1	1	Infant	Yes	N/A
2	2	Infant	Yes	N/A
3	3	Infant	Yes	N/A
4	4	Infant	Possible	N/A
5	5	Infant-Perinate	No	N/A
6	6	Infant	Yes	N/A
7	7	Infant	Yes	N/A
8	8	Infant	Possible	N/A
9	9a	Infant	No	N/A

9	9b	Fetal	No	N/A
10	10	Infant	No	N/A
11	11	Infant	Possible	N/A
12	12	Infant	Yes	N/A
13	13	Infant-Perinate	No	N/A
14	14	Infant	Yes	N/A
15	15	Infant	Yes	N/A
16	16	Fetal	No	N/A
20	20	Adult-Young	Yes	Male
21	21	Adult-Young	Yes	Female
23	23	Fetal	No	N/A
24	24	Infant-Perinate	Yes	N/A
25	25	Infant	Yes	N/A
26	26	Fetal	Yes	N/A
28	28	Adult-Middle	Yes	Male
29	29	Infant	Yes	N/A

30	30	Child	Yes	N/A
31	31	Child	Possible	N/A
32	32	Infant	Yes	N/A
33	33a	Adult-Young	Yes	Female
33	33b	Infant	No	N/A
34	34	Infant- Perinate	No	N/A
35	35	Infant	No	N/A
36	36	Child	Yes	N
37	37	Fetal	No	N/A
38	38	Infant	No	N/A
39	39	Child	Yes	N/A
40	40	Infant	Yes	N/A
41	41	Infant	Yes	N/A
42	42a	Child	Yes	N/A
42	42b	Child	Yes	N/A
45	45	Fetal	No	N/A
46	46	Child	No	N/A

47	47	Infant	No	N/A
48	48	Infant	Yes	N/A
49	49	Infant-Perinate	No	N/A
51	51	Fetal	Yes	N/A
52	52	Indeterminate	No	N/A
55	55	Infant-Perinate	No	N/A
64	64a	Child	Yes	N/A
64	64b	Infant	Yes	N/A
64	64c	Fetal	No	N/A
125	125	Fetal	Yes	N/A
126	126	Infant	Yes	N/A
127	127	Infant	Yes	N/A
128	128	Fetal-Perinate	No	N/A
129	129	Infant	No	N/A

130	130	Infant	Yes	N/A
131	131	Fetal-Perinate	No	N/A
133	133	Fetal	Yes	N/A
135	135	Fetal-Perinate	Possible	N/A
137	137	Child	Yes	N/A
138	138	Infant	No	N/A
140	140	Fetal	Yes	N/A
141	141	Infant	No	N/A
142	142	Infant	Yes	N/A
143	143	Fetal	No	N/A
144	144	Infant	No	N/A
145	145	Fetal	No	N/A
146	146	Infant	No	N/A
147	147	Fetal	Yes	N/A
148	148	Child	Yes	N/A
149	149	Infant	Yes	N/A

150	150	Infant- Perinate	No	N/A
151	151	Infant	Yes	N/A
152	152	Infant	No	N/A
153	153	Infant	Yes	N/A
154	154	Infant- Perinate	Yes	N/A
155	155	Infant- Perinate	Yes	N/A
156	156	Child	Yes	N/A
157	157	Child	Yes	N/A
158	158	Infant	Yes	N/A
159	159	Fetal	No	N/A
160	160	Infant- Perinate	Yes	N/A
161	161	Fetal	No	N/A
162	162	Fetal	No	N/A
163	163	Infant	No	N/A

164	164	Infant	Yes	N/A
165	165	Infant-Perinate	Possible	N/A
166	166	Infant	No	N/A
167	167	Infant-Perinate	Possible	N/A
168	168	Infant-Perinate	No	N/A
169	169	Infant-Perinate	No	N/A
171	171	Infant	No	N/A
172	172	Infant	No	N/A
173	173	Infant	No	N/A
175	N/A	N/A	N/A	N/A
176	176	Infant	Yes	N/A
177	177	Infant	Yes	N/A
178	178	Infant	Yes	N/A
179	179	Child	Yes	N/A

180	180	Infant	Yes	N/A
182	182	Infant	Yes	N/A
183	183	Infant-Perinate	Yes	N/A
184	184	Infant	Yes	N/A
185	185	Fetal	Yes	N/A
186	186	Fetal	Yes	N/A
187	187a	Infant-Perinate	Yes	N/A
187	187b	Fetal	No	N/A
F01	999	Infant	Yes	N/A
F02	N/A	N/A	N/A	N/A

The Ss. Peter and Paul Sample: Estimated Age

The age distribution of the individuals interred in this portion of the cemetery falls outside the expectations one would expect from a typical cemetery (Figure 3.2, Figure 3.3). Given that only a portion of the cemetery was excavated and that the graves were unmarked, this particular cemetery population can truly be described as a random sample.

Figure 3.2: Spatial distribution by age at Ss. Peter and Paul Cemetery (Watson et al 2017).

As a group, the individuals recovered would best be characterized as young and rather sick (Jeske and Strange 2017). The age distribution of the cemetery sample can be found on Table 3.2. Only four individuals fall into the adult category (3.7%). Approximately 22% of the sample was categorized as being of fetal age, while 13 children (12%) were over the age of five. The rest of these individuals (62%) were aged between birth and five years of age.

Table 3.2. Frequencies of Age at Death.

Age at Death	**N**	**%**
Adult-Middle	1	0.9
Adult-Young	3	2.8
Child	13	12.0

Infant	51	47.2
Infant-Perinate	16	14.8
Fetal	24	22.2
Total	108	100.0

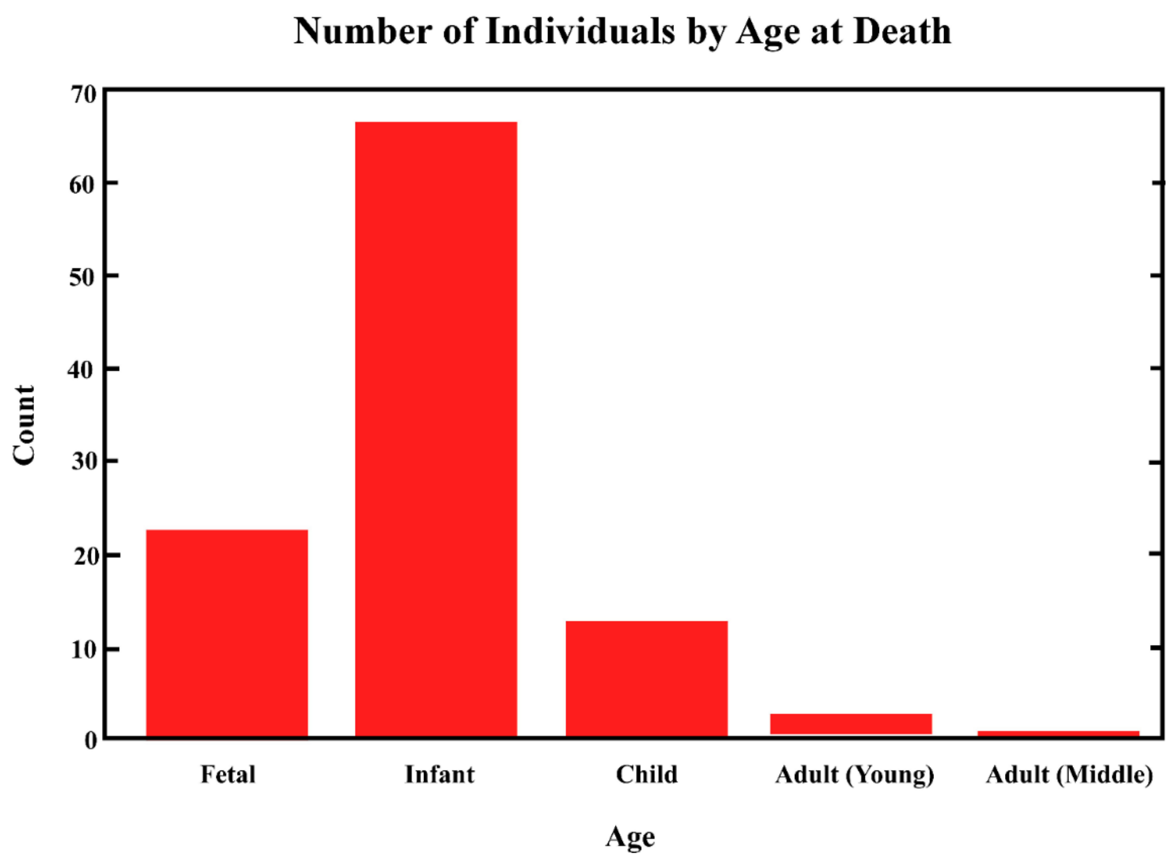

Figure 3.3: Ss. Peter and Paul Age Distribution at Death

Estimated Sex

Sex categories were only assigned to individuals estimated to be of adult age (Table 3.3). Since there are only four individuals that were estimated to be of adult age, inferences that are able to be made are negligible.

Table 3.3: Frequencies of Sex	
Sex	**Freq.**
Female	2
Male	2
N/A	104
Total	108

Identification and Distribution of Pathological Conditions

Frequencies of pathological lesions per individual are a moderate 55.5% (Table 3.4). However, the fibrous nature of developing osseous tissue characterizing subadult individuals, particularly during the first couple years of life, make accurate and precise statements difficult. Therefore, accuracy was given primacy over precision while attempting to characterize the sample's pathological profile. As such, interpretations were made in conservative fashion while, conversely, every effort was made to investigate a potential anomaly before a given lesion was dismissed. Therefore, in some cases a lesion was flagged as a potential pathology. These potential pathologies were NOT included in statistical analyses. However, comments on possible pathological conditions are noted in the burial descriptions found in the Appendix.

Table 3.4: Frequencies of Pathology.		
Pathology	**N**	**%**
No	41	38.0
Possible	7	6.5
Yes	60	55.5
Total	108	100

The chi square statistic is commonly utilized for inter and intra-sample comparisons and analyses regarding pathological conditions found in skeletal populations (Dougherty 2011, Grauer and Roberts 1996, c.f. Jeske and Strange 2017). Chi square analyses were performed for intra-sample comparisons and inter-site comparisons utilizing Microsoft Excel 2016 in conjunction with the RealStats and Data Analysis add-on extensions. The customary level of probability for indicating statistical significance is $p<0.05$. However, as noted by Wasserstein and colleagues (2016), the probability value of 0.05 was never meant to constrain logical interpretation of identifiable patterns. Patterns within the sample that are clearly visible despite a lack of statistical significance at the $p<0.05$ benchmark are still discussed.

For example, one visible pattern is the relationship between age at death and pathology (Table 3.5). The Pearson's Chi Square statistic equals 17.492 with 10 degrees of freedom and a probability of ($p=0.06416$). This probability lies just outside the cut-off between the realm of statistical significance and a random distribution. However, the issue is related to the small sample-size of each category, not in the age-progression pattern itself (Jeske and Strange 2017). Given the structure of the age-progression scheme and a probability of just over (0.06), it is likely that there is a significant difference in the proportion of pathological individuals and that it is probably not random.

Table 3.5: Crosstabulation of Age at Death and Pathology

	Pathology							
	No		Possible		Yes		TOTAL	
	Obs	%	Obs	%	Obs	%	Obs	%

Age At Death	Adult-Middle	0	0	0	0	1	100	1	100
	Adult-Young	0	0	0	0	3	100	3	100
	Child	1	8	1	8	11	85	13	100
	Fetal	15	63	1	4	8	33	24	100
	Infant	17	33	3	6	31	61	51	100
	Infant-Perinate	8	50	2	13	6	12	16	100
	TOTAL	41	38	7	6	60	56	108	100
Pearson's Chi Square: 17.492, 10 df., p = 0.06416									

We can, in fact, derive a traditional statistically significant result if we collapse the age-progression categories and simply compare those falling into fetal, infant, child, and adult categories. By expanding the number in each category, we sacrifice precision further but increase accuracy (Table 3.6). The age progression pattern has a probability of (p= 0.02370), indicating that it is not likely that the pattern is random.

Table 3.6: Crosstabulation of Age at Death and Pathology, collapsed categories.

		Pathology							
		No		Possible		Yes		TOTAL	
		Obs	%	Obs	%	Obs	%	Obs	%
Age At Death	Adult	0	0	0	0	4	100	4	100
	Child	1	8	1	8	11	85	13	100
	Infant	25	37	5	7	37	55	67	100
	Fetal	15	63	1	4	8	33	24	100
	TOTAL	41	38	7	6	60	56	108	100
Pearson's Chi Square statistic: 14.59, 6 df., p= 0.02370									

The relationship between age-at-death and pathology can be visualized another way utilizing graphical proportions (Figure 3.4 and 3.5). Approaching the issue through both methods utilized above illustrates that the frequencies of observed pathologies is consistent with increasing age. Essentially, the older an individual was, the more likely they were going to exhibit a pathological condition (Jeske and Strange 2017). It is worthwhile to note that all four adults exhibit pathology in one form or another, while only 55% of the general population

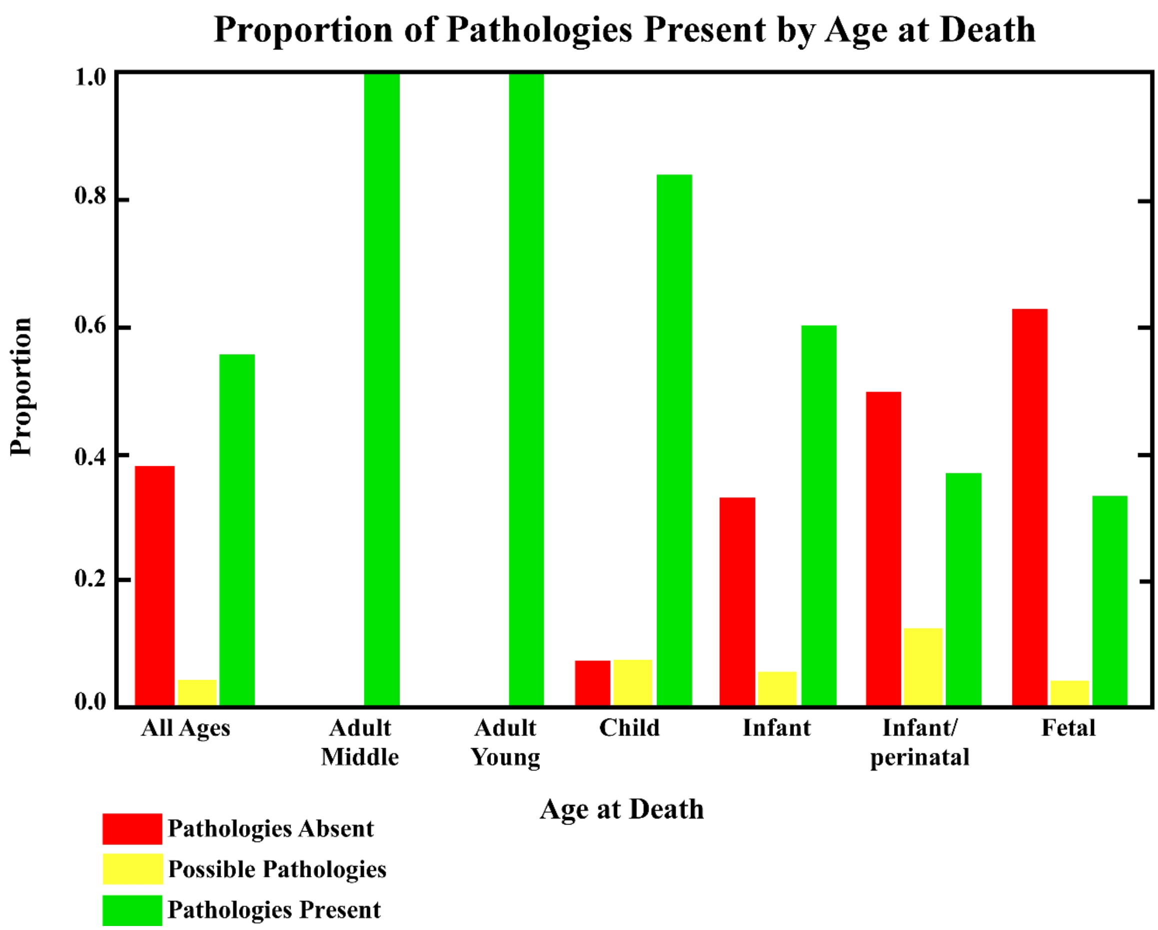

Figure 3.4: Proportion of Pathologies Present by Age Category

did so overall. The small sample size of the adult categories (n=4) makes any inference regarding rates of pathology within the category speculative at best. Nonetheless, noting that pathological conditions are often the result of, or related to, persistent or chronic infections, the rate of pathology in relation to age is unsurprising.

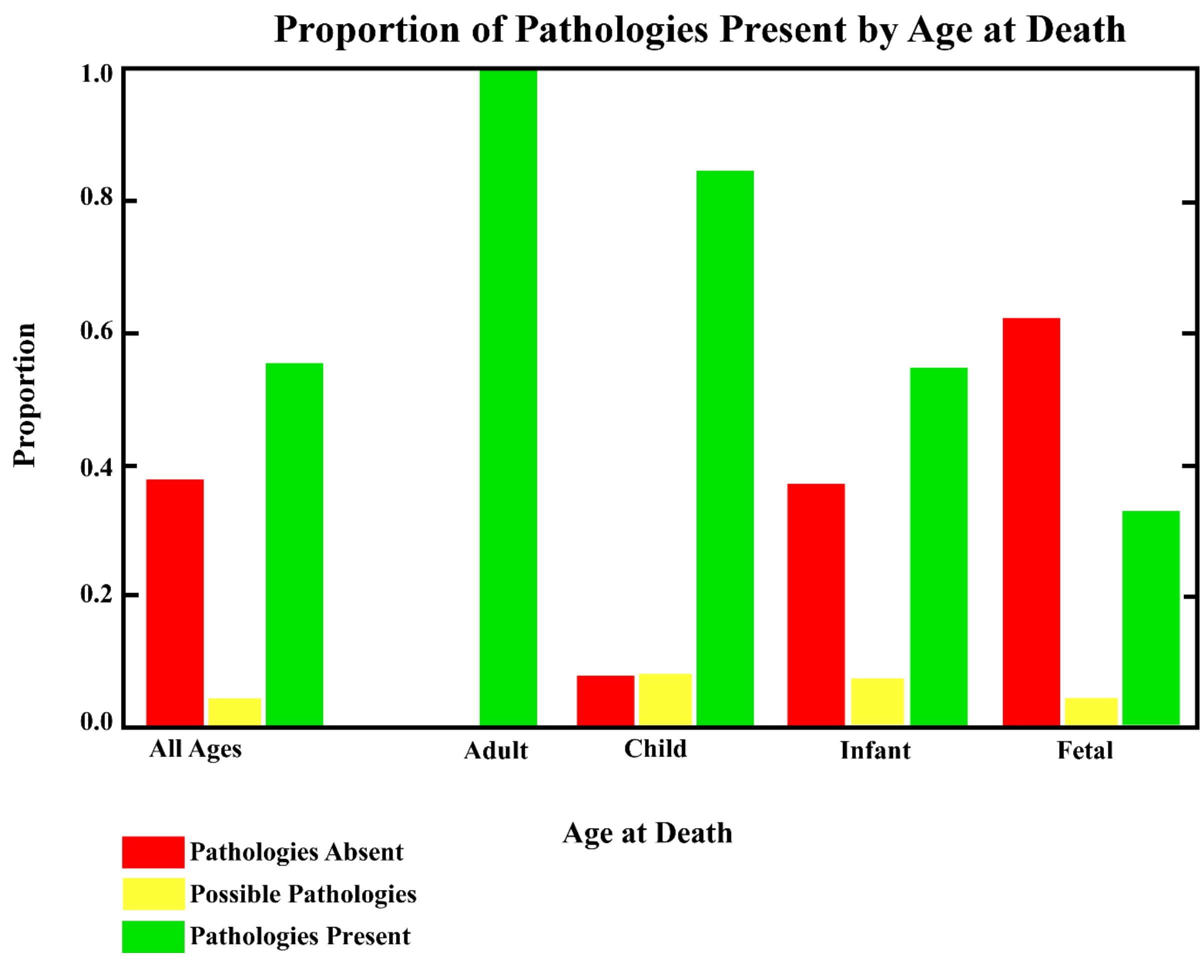

Figure 3.5: Proportion of Pathologies Present by Collapsed Age Category

The pattern presented illustrates a population with high proportions of perinatal illness, including those individuals identified as fetal and infant ages. Having noted the high level of pathology present at the individual level, it is necessary to describe the distribution of pathology by bone type. One immediate observation presented is that of the 59 individuals coded with pathology, 61% (n=36) were coded with lesions in one form or another on one than more bone (Jeske and Strange 2016). The primary pathological conditions observed within the subadult sample are discussed below (Table 3.7). The list is adapted from and expands upon the burial report produced by Jeske and Strange (2017) for Commonwealth Heritage Group.

Table 3.7: Inventory of Individuals with Pathologies.			
Individual	**Bone**	**side**	**Pathology**
1	occipital	general	lesion, sclerotic
2	occipital	general	lesion, non-sclerotic
2	temporal	bilateral	lesion, non-sclerotic
2	frontal	bilateral	porotic hyperostosis
2	parietal	left	porotic hyperostosis
3	parietal	general	lesion, diffuse
3	temporal	left	lesion, non-sclerotic
3	frontal	left	porotic hyperostosis
6	femur	bilateral	twisting
7	occipital	general	lesion, non-sclerotic
7	parietal	right	lesion, non-sclerotic
12	temporal	bilateral	lesion, sclerotic
14	frontal	right	porotic hyperostosis
14	parietal	left	porotic hyperostosis
15	occipital	general	blastic
15	temporal	bilateral	lesion, non-sclerotic
15	zygomatic	bilateral	lesion, non-sclerotic
20	frontal	bilateral	cribra orbitalia
20	maxilla	left	lesion, sclerotic

20	vertebra, thoracic	general	Schmorl's nodes
21	ilium	right	arthritis
21	sacrum	general	arthritis
24	frontal	bilateral	lesion, diffuse
25	frontal	left	fracture
25	temporal	bilateral	lesion, sclerotic
28	ilium	bilateral	arthritis
28	ulna	right	arthritis
28	humerus	right	blastic
28	ulna	right	blastic
28	humerus	bilateral	twisting
29	femur	bilateral	lesion, non-sclerotic
29	frontal	left	lesion, non-sclerotic
29	occipital	lateral	lesion, non-sclerotic
29	parietal	bilateral	lesion, non-sclerotic
30	temporal	right	lesion, non-sclerotic
31	temporal	bilateral	lesion, non-sclerotic
33a	vertebra, cervical	general	arthritis
33a	vertebra, thoracic	general	arthritis
33a	femur	left	blastic
33a	occipital	general	lesion, non-sclerotic
33a	femur	general	lesion, sclerotic
33a	femur	bilateral	twisting
33a	vertebra, thoracic	general	arthritis
33a	vertebra, thoracic	general	expanded rib facet
36	ethmoid	general	lesion, non-sclerotic

36	humerus	right	lesion, non-sclerotic
36	lacrimal	general	lesion, non-sclerotic
36	zygomatic	left	lesion, non-sclerotic
39	frontal	right	porotic hyperostosis
40	frontal	bilateral	lesion, non-sclerotic
41	frontal	bilateral	lesion, non-sclerotic
42a	frontal	bilateral	cribra orbitalia
42a	temporal	bilateral	lesion, non-sclerotic
42b	frontal	bilateral	cribra orbitalia
42b	sphenoid	general	lesion, non-sclerotic
42b	temporal	right	lesion, non-sclerotic
48	temporal	bilateral	lesion, non-sclerotic
51	temporal	left	lesion, non-sclerotic
51	maxilla	left	lesion, sclerotic
64a	frontal	left	cribra orbitalia
125	frontal	left	cribra orbitalia
126	frontal	bilateral	lesion, non-sclerotic
126	parietal	left	lesion, non-sclerotic
127	ischium	bilateral	lesion, non-sclerotic

127	occipital	general	lesion, non-sclerotic
130	occipital	general	blastic
130	occipital	basilar	lesion, sclerotic
133	mandible	left	lesion, non-sclerotic
133	zygomatic	bilateral	lesion, non-sclerotic
135	frontal	left	lesion, non-sclerotic
135	occipital	basilar	lesion, non-sclerotic
137	frontal	bilateral	cribra orbitalia
137	temporal	bilateral	lesion, non-sclerotic
140	mandible	left	lesion, non-sclerotic
142	temporal	left	lesion, diffuse
148	frontal	bilateral	lesion, diffuse
148	parietal	left	lesion, diffuse
148	maxillae	left	lesion, sclerotic
149	frontal	left	cribra orbitalia
149	occipital	basilar	lesion, non-sclerotic
151	frontal	right	lesion, non-sclerotic
151	occipital	general	lesion, non-sclerotic
151	parietal	bilateral	lesion, non-sclerotic
151	zygomatic	bilateral	lesion, non-sclerotic
153	frontal	bilateral	cribra orbitalia

153	frontal	bilateral	lesion, diffuse
153	temporal	bilateral	lesion, non-sclerotic
153	occipital	general	lesion, sclerotic
154	zygomatic	left	lesion, diffuse
155	fibula	left	lesion, non-sclerotic
155	temporal	bilateral	lesion, non-sclerotic
155	tibia	left	lesion, non-sclerotic
155	zygomatic	bilateral	lesion, non-sclerotic
156	humerus	bilateral	lesion, sclerotic
157	temporal	bilateral	lesion, non-sclerotic
158	frontal	bilateral	lesion, diffuse
160	occipital	general	lesion, non-sclerotic
164	maxilla	left	lesion, non-sclerotic
164	sphenoid	right	lesion, sclerotic
164	temporal	left	lesion, sclerotic
164	frontal	left	porotic hyperostosis
165	parietal	right	lesion, sclerotic
176	occipital	general	lesion, non-sclerotic
176	temporal	bilateral	lesion, non-sclerotic
176	parietal	left	porotic hyperostosis
177	temporal	bilateral	lesion, sclerotic

177	frontal	bilateral	porotic hyperostosis
178	temporal	bilateral	lesion, non-sclerotic
179	mandible	left	lesion, non-sclerotic
179	vertebra, cervical	general	lesion, non-sclerotic
179	occipital	general	lesion, sclerotic
180	Infant	bilateral	twisting
182	frontal	left	cribra orbitalia
182	temporal	right	lesion, sclerotic
183	temporal	bilateral	lesion, non-sclerotic
183	frontal	left	porotic hyperostosis
184	frontal	left	lesion, non-sclerotic
184	temporal	bilateral	lesion, non-sclerotic
186	frontal	right	cribra orbitalia
186	femur	left	lesion, sclerotic
186	temporal	right	lesion, sclerotic
187a	occipital	general	lesion, sclerotic
187a	temporal	bilateral	lesion, sclerotic
999	frontal	right	cribra orbitalia
999	frontal	bilateral	lesion, non-sclerotic

Porotic Hyperostosis and Cribra Orbitalia

Ten subadults were observed with indications of porotic hyperostosis, while another ten were observed with cribra orbitalia. No individuals were observed with both conditions

concomitantly. Porotic hyperostosis and cribra orbitalia manifest as macroscopic porosity on the bones of the cranial vault or the orbital roofs, respectively. Extensive radiographic and histological studies indicate that these lesions result from an over-expansion of the bone marrow at the expense of a thinning of the outer table of the skull, widening of the inner diploe, and a conspicuous hair-on-end appearance of the trabecular structures (Lewis 2007). Both conditions are frequently associated with similar etiological and pathological pathways, though more recent research challenges this assumption (e.g. Ortner and Putschar 1981, Walker et al 2009, Wapler et al 2004). Nevertheless, these conditions are often associated to greater or lesser extent with anemia resulting from deficiencies in iron, vitamin B, vitamin D, or vitamin C anemia (Djuric et al 2008, Keenleyside and Panayotova 2006, Lewis 2007, McIlvane 2015, Obertova and Thurzo 2008). However, anemia does not always result from nutritional deficiencies; it can result from blood loss, pregnancy, chronic disease, poor hygiene, and parasitic infection (Roberts and Manchester 2005, Wapler et al 2004,).

Non-specific Lytic and Blastic Lesions

There are 48 subadults that were observed with lytic lesions, while two subadults were observed with blastic lesions. 21 individuals of the 48 observed with lytic lesions had lesions on more than one element. Two individuals were observed with blastic and lytic lesions. Non-specific lesions, or lesions that cannot be traced through specific etiology, that are observed on skeletal material are divided into two categories: osteolytic lesions and osteoblastic lesions. Lesions of the lytic variety are characterized by abnormal bone loss found anywhere on the skeleton, while osteoblastic lesions are hypertrophic and are characterized by abnormal bone deposition (White et al 2012, Bluma 2015). Lytic lesions are similar in nature to other non-

specific conditions such as periostitis and osteomyelitis, but should not be confused by these recognizable afflictions. Periostitis is characterized by an inflammation of the thin periosteum that covers all bones. Osteomyelitis represents a severe infection that has penetrated the outer table and results in deep abscesses of the inner table, diploe, and marrow (White et al 2012). Neither periostitis nor osteomyelitis were observed within the Ss. Peter and Paul sample.

Twisting

Two subadults were observed with twisted/bowed femora. Twisting and/or bowing is a deformation in the morphology of the bone due to asymmetrical growth. The asymmetry may be the result an abnormal expansion of the cancellous bone, the results of diseases such as Rickets, Blount's Disease or treponemal diseases, or many other issues (Mann and Hunt 2005:153; Weiss 2015:67).

The set of extant pathological cases is represented by a small set of relatively well-known categories, such cribra orbitalia, porotic hyperostosis, and general osteolytic or hyperopic (osteoblastic) lesions. The majority of pathological conditions are characterized by lesions found on the cranial bones. Lesions found on these elements account for 97 of the 124 (78%) identified pathologies (Table 3.8). It is apparent that a relatively limited set of afflicted bones were identified as pathological (Table 3.9).

Table 3.8: Occurrences of pathologies observed on bones.

Pathology	**N**
lesion, non-sclerotic	57
lesion, sclerotic	20
lesion, diffuse	8

Lesion, blastic	5
lesions, total	**90**
cribra orbitalia	11
porotic hyperostosis	10
arthritis	7
Schmorl's nodes	1
expanded rib facet	1
fracture	1
twisting	3
Total observations	124

Table 3.9: Bones identified with pathologies.

Bone	**N**
Cranium, ethmoid	1
Cranium, lacrimal	1
Cranium, frontal	31
Cranium, maxilla	4
Cranium, occipital	17
Cranium, parietal	10
Cranium , sphenoid	2
Cranium , temporal	25
Cranium , zygomatic	6
Cranium total	**97**
mandible	3
humerus	4
fibula	1
ulna	2
ilium	2
ischium	1
sacrum	1
femur	6
tibia	1
vertebra, thoracic	3
vertebra, cervical	2
vertebra, thoracic	1
Total	**124**

Jeske and Strange (2016) note that there are three potential reasons for the disparity in the distribution of pathological lesions. First, cribra orbitalia and porotic hyperostosis are common childhood pathological manifestations expressed upon the cranial vault. Second, the assemblage is heavily affected by taphonomic processes resulting in very poor overall preservation of the skeletal material. The sandy soil found frequently in western Wisconsin allows for excellent water flow and drainage; however, these factors also deteriorate bone to a high degree over relatively short spans of time. Since a majority of individuals were missing some or all of their postcranial bones, the fact that the most pathological observations were noted on the crania is hardly surprising. The result of these taphonomic considerations is that there is an overall overrepresentation of cranial elements, which are also the largest elements, within the sample. A full description of the archaeological context and soil profile of the project area can be found in Watson et al (2017). Third, many of the cranial pathologies can be found on the temporal and occipital bones. These anomalies are, in many cases, characterized by deep lytic lesions on the temporals and significant areas of remodeling found on the infracranial surfaces of the occipital. These traits may be manifest as a result of inflammation due to severe infection caused possibly by ailments such as mastoiditis and meningitis. Bacterial meningitis is a common infant affliction, and this malady in particular was a significant cause of death during the late 19th and early 20th centuries (Jeske and Strange 2017, Preston and Haines 2014).

Nonetheless, while noting the above considerations, cranial bones are more likely to show manifestations of a pathological condition than other types of bones (Table 3.10). The Chi Square statistic describing the relationship of pathology to skeletal element is 135.878, with 28 degrees of freedom. As one might expect, the probability that the distribution is random is very

low (p= <0.001), and highly statistically significant. However, due to the large number of cells with expected frequencies below five, we can again collapse categories into bone type versus lesion (Table 3.11). Here, the Chi Square distribution contains several categories but the pattern is still clear. We can further clarify the pattern by collapsing categories into a 2x2 table (Table 3.12).

Table 3.10: Relationship of pathology to Bone Type.

Pathology	**Bone Type**					
	crania	hip	limb	mandible	vertebrae	Total
lesion	73	1	7	3	1	85
cribra orbitalia	11	0	0	0	0	11
porotic hyperostosis	10	0	0	0	0	10
arthritis	0	3	1	0	4	8
blastic	2	0	3	0	0	5
fracture	1	0	0	0	0	1
Schmorl's nodes	0	0	0	0	1	1
twisting	0	0	3	0	0	3
TOTAL	97	4	14	3	6	124

Pearson's Chi Square statistic: 135.878, 28 df, p value: < 0.001 (0.000)

Table 3.11: Relationship of (Collapsed) Pathology to Bone Type

	Bone Type					
Pathology	Crania	Hip	Limb	Mandible	Vertebrae	Total
Yes	97	4	14	3	6	124
No lesion	11	104	94	105	102	416
Total	108	108	108	108	108	540

Pearson's Chi Square Statistic= 344.97, 4 df. P-value<0.0001

It is also interesting to visualize the relationship between pathologies and elements graphically (Figure 3.6). Here, it is easy to see that pathological lesions are dominant on all element types recorded with their presence except for vertebrae. Limb bones are the only element expressing

Table 3.12: Relationship of Pathology to Bone Type, Collapsed Categories

	Bone Type		
Pathology	**Crania**	**Post-Crania**	**Total**
Lesion	97	27	124
No lesion	11	81	92
Total	108	108	216

Pearson's Chi Square Statistic= 92.77, 1df, $p < 0.0001$

noticeable deformation, twisting in this case. Finally, and unsurprisingly, Schmorl's nodes are only found on the vertebrae (Jeske and Strange 2017).

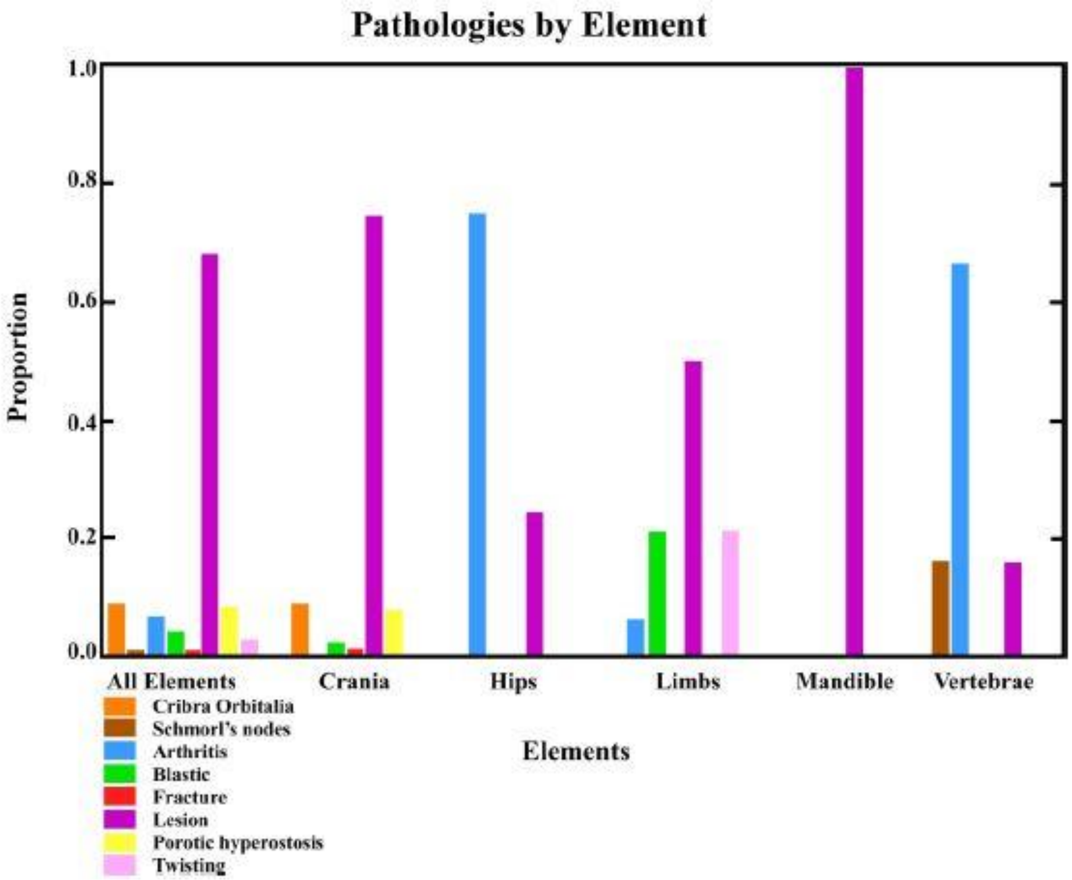

Figure 3.6: Pathologies by Element

Dental Pathology

The sample, taken as a whole, is not characterized as having excessive dental defects (Table 3.13). The lack of significant dental defects is a product of the overall extremely young age of the sample. Unsurprisingly, the most common defect is the carious lesion, followed by calculus (Table 3.14).

Table 3.13. Individuals with Dental Defects.

Dental Defects	N	%
None	94	87
Defect	14	13
Total	108	100

Caries were recorded by individual, not by rate of carious lesions per tooth. Dental pathology and associated defects are strongly associated with age. The unsurprising inference that follows is that the older an individual is, the more likely they are to express a dental defect (Table 3.15, Figure 3.7).

Table 3.14. Dental Defects by type.

Defect	N	%
caries	10	9.3
calculus	3	4.6
abscess	3	2.8
deformed	2	1.9
remodeling	3	1.9
impacted	1	0.9
Perikymata	1	0.9
Total	23	22.2

It is also of little surprise that no fetuses and very few infants (2.8%) exhibit dental pathology. Older children (61.5%) and adults (100%) showed dental pathology in some manner. Surprisingly, no incidences of enamel hypoplasia were observed among adults or subadults. Given the overall prevalence of other traditional indicators of nutritional stress observed within this population, this is somewhat of an anomaly. The overall dental health of the sample is not particularly good, but not unusual for the late 19th and early 20th centuries (Jeske and Strange 2017).

Table 3.15. Dental Defects by Age Category.

		Dental					
		No		yes		TOTAL	
		Obs	Exp	Obs	Exp	Obs	Exp
	Adult	0	3.5	4	0.5	4	4.0
	Child	5	11.3	8	1.7	13	13.0
	Fetal	22	19.1	0	2.9	22	22.0
	Infant	66	59.1	2	8.9	69	68.0

Age	TOTAL	93	93.0	14	14.0	108	107.0

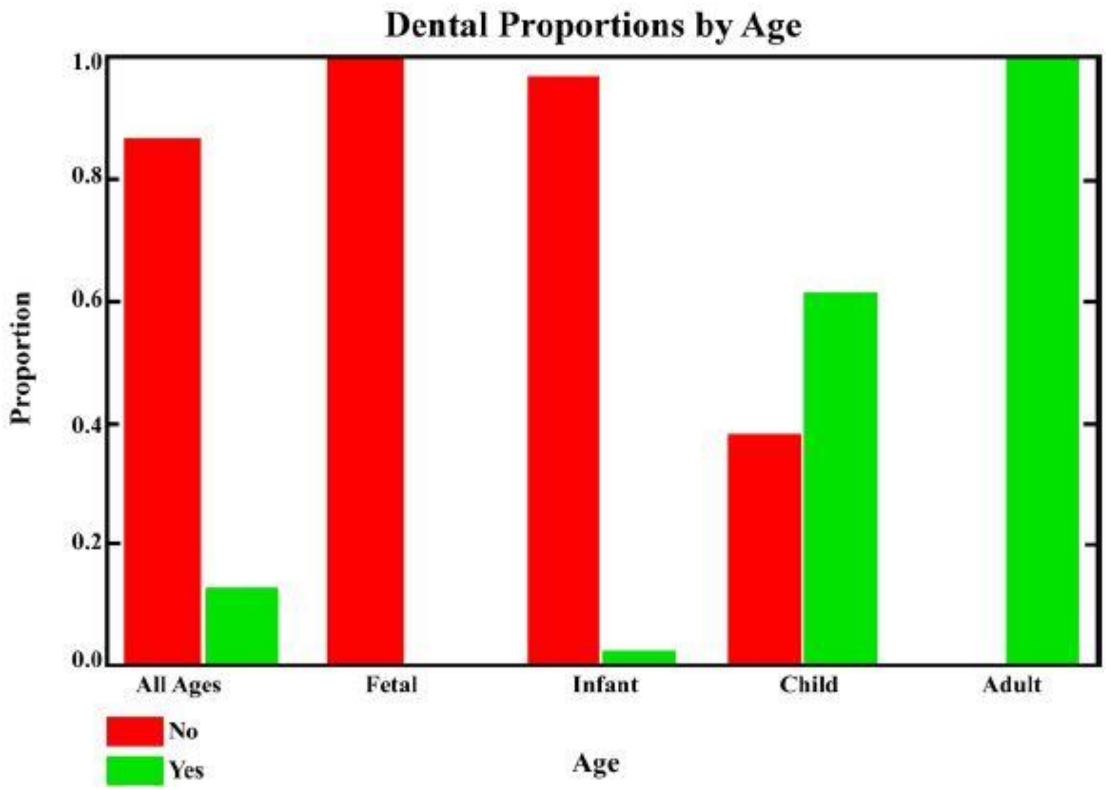

Figure 3.7: Dental Proportion by Age Category

Discussion

The Adults:

The portion of the sample with an estimated adult age numbers four (3.7%) and is very small relative to the overall excavated population (Jeske and Strange 2017). The sexes are represented evenly by two females (Individuals 21 and 33a) and two males (Individuals 20 and 28). One female (Individual 33a) was recovered with a second individual of infant-perinate age. Preservation of the adult individuals range from fair to good, allowing for calculations of estimated stature (Jeske and Strange 2017, White et al 2012:420, Table 18.5). Table 3.16 illustrates the estimated stature of the four adults. The case of individual 33a is complicated

owing to the pathological nature of her femora. Her stature calculated from the long bones of the arm suggest an estimated stature between 4’11” and 5’0”, while her left and right femora suggest statures of 4’7” and 4’9”, respectively. The limited number of adults limits any attempt at inferences at the population level in terms of demographic mortality profiles and pathological patterns (Jeske and Strange 2017). A descriptive analysis of the four adult individuals can be found in the Appendix.

Table 3.16: Estimated Adult Stature

Individual	Stature Estimate	Elements Measured
20	5’6” ± 1” to 5’11” ± 4”	All except for the right ulna and radius; both fibulae
21	5’0” ± 2” to 5’2” ± 1”	Left humerus; right radius; both femora and tibia
28	5’6” ± 2” to 5’8” ± 1”	Both humerii, femora; right ulna, radius; left fibula, tibia
33a	4’7” to 5’ 0”	Both Femora and tibia

The Children:

The remaining 96.3% of these individuals are aged twelve years or under. It is understood through the incidence and distribution of pathologies across estimated age categories that the older an individual is, the more likely it is some sort of pathology will manifest. Furthermore, there are high proportions of fetuses and infants that express some kind of pathological condition.

The relative distribution of pathologies such porotic hyperostosis, cribra orbitalia and non-specific osteolytic and osteoblastic lesions suggest a pattern in which mothers may be suffering from nutritional stress or illness, including anemia (Wapler et al 2014). These non-specific indicators may also suggest a number of congenital issues such as rubella, tuberculosis, syphilis and others (Cantey et al 2013, Lewis 2007, Ortner and Putschar 1981). Indications of possible infection are primarily limited to non-specific lytic lesions, though there is a high potential for lesions observed on the mastoid region of the temporal bone to be linked to mastoiditis. Given the overall high rates of pathology, it is somewhat surprising to note that there were no cases of periostitis, another non-specific pathological condition, observed within this sample. Any differential diagnoses with regards to pathological conditions observed on bone are predicated upon two variables: the type of bone abnormality and the distribution of these defects (Ortner 2003). Possible conditions contributed to the observed pathology data are considered below.

Anemia:

The high incidence of porotic hyperostosis and cribra orbitalia make anemia a tempting culprit for the pathological patterns observed. Anemia is considered to result from poor nutrition and dietary stress, and is often associated with iron deficiency (Lewis 2007). However, Walker and others (2009) argue that iron deficiency anemia does not adequately explain porotic hyperostosis and some forms of cribra orbitalia. They offer instead that these conditions are the result of megaloblastic anemia acquired by nursing infants through a combination of factors: depleted maternal B_{12} and unsanitary living conditions, both of which are conducive to gastrointestinal infection around the time of weaning. They argue further that cribra orbitalia has

a greater range of causes than porotic hyperostosis, and that a codeficiency of vitamin C and B_{12} combine to explain the condition in some southwestern populations (Walker et al 2009).

The complete lack of enamel hypoplasia among the entire population, subadult and adult, seems to indicate that nutritional stress alone may not play a primary role in the formation of these lesions. Obertova and others (2008) note that iron deficiency alone is not enough to disrupt childhood growth and leave enamel hypoplasia observably on the teeth. Several studies have noted that the pathogenesis of iron deficiency is rarely attributable to single factor and that constitutional factors such as innate iron stores at birth, birth weight, growth rate, as well as respiratory and gastrointestinal infections may contribute to the malady. All of these factors can affect the bioavailability of iron and the biological resistance of the host. Given the overall incidence of porotic hyperostosis and cribra orbitalia, issues with weaning and the diet of mothers seem to be highly possible issue. Clearly, a multitude of other factors may have played a role as well.

Treponemal Disease:

Treponematosis represents a family of specific disease syndromes: venereal and endemic syphilis, yaws, and pinta (Larsen 1997). All of these diseases manifest skeletally with the exception of pinta; however, the lesions which manifest as a result of the other three are similar and difficult to differentiate from one another (Harper et al 2011, Klaus and Ortner 2013, Larsen 1997). Pinta is the least virulent and is limited to skin manifestations (Klaus and Ortner 2013). It is entirely possible that these diseases result from infection by the same bacterial species, but manifest differently due to cultural and environmental factors which influence the mode of infection (Larsen 1997, Manchester and Roberts 2005). Yaws is typically acquired during childhood, thus the bacterial load by the time the individual is of child-bearing age and is thus

not often transmitted (Harper et al 2011:102). Others argue that Yaws is not transmittable at all to the unborn child (Manchester and Roberts 2005:151). Conversely, venereal syphilis is acquired after maturity is reached, increasing the probability of transmittal of the bacterial load. Accordingly, congenital syphilis then indicates a very strong likelihood that venereal syphilis is present in the overall host population (Harper et al 2013, Manchester and Roberts 2005).

Lewis (2007:151) notes that congenital syphilis manifests at birth and develops in the fetus secondary to maternal venereal syphilis and that it can be transmitted to the fetus as early as the ninth week of gestation (Harper et al 2011). Assuming the child survives birth, syphilis has three main stages which are demarcated by conspicuous physiological manifestations, or the lack thereof: primary, secondary, and tertiary (Harper et al 2011). At all stages, tissue damage causes both localized and systemic inflammation; however, distinctive skeletal manifestations typically occur only in the tertiary, or last, stage. Only in rare cases does the skeleton show sign of infection during the primary stage; these lesions are typically small and non-diagnostic. Lesions incurred during the secondary stage, too, are typically periosteal or subperiosteal nondescript lesions (Harper et al 2011). The tertiary stage involves periosteal reactions, osteitis, osteomyelitis (Harper et al 2011, Manchester and Roberts 2005). Others note that dental defects can manifest around 30% of the time among survivors, including conditions Fournier's canines, Moon's molars, and mulberry molars, all of which originate in the process of amelogenesis (Lauc et al 2015). Lesions are often systemic and bilateral (Harper et al 2011) while syphilis affects the cranial bones more than other treponemal diseases, producing a distinctive, worm-eaten and sclerotic appearance (Schwartz 2007).

Tuberculosis:

Tuberculosis is a chronic infectious disease most often affecting subadults and is transmitted between humans via the respiratory system, and may be spread from animal to human via consumption of infected animal products (e.g. milk) (Dawson and Brown 2012, Lewis 2007, Lewis 2011, Schwartz 2005). This disease can affect the lungs, skin, lymph nodes, intestines, and bones, and is readily identified in subadult remains. Lewis (2007:146) notes that "infected children represent the pool from which a large proportion of infected adults will arise and, because children are usually infected by adults, child cases indicate on ongoing transmission of (tuberculosis) within a community". Clinically, the disease has been shown to be normally evident between one and six months after infection, and in contemporary populations age groups falling within the 1-5, 15-30, and after 60, express the highest frequencies of the disease (Lewis 2007).

Skeletal modifications as a result of tuberculosis are typically found in the spine and joints, particularly the innominates (Manchester and Roberts 2005, Schwartz 2005, Dawson and Brown 2012)), and also the ribs (Larsen 1997, Lewis 2007). Tuberculosis has also been associated with the long bones, most commonly the tibia and femora. The disease is associated with progressive bone destruction and often manifests skeletally with periostitis and osteomyelitis (Larsen 1997). The primary manifestation of the disease is most often associated with spinal lesions; the effects of the disease elsewhere on the skeleton are more difficult to discriminate from other causal factors. Even spinal pathology does not provide a clear-cut diagnosis of the disease; other pathogenic causes such as chronic pyogenic osteomyelitis, traumatic and rheumatoid arthritis, malignancy, typhoid spine, and several others, must be eliminated before a positive diagnosis can be asserted (Schwartz 2005).

Rickets:

Rickets is a disease that is typically resultant from a deficiency in vitamin D (Lewis 2007, Mays 2008). Approximately 90% of vitamin D absorbed by the body is facilitated through the absorption of ultraviolet sunlight but also from diets that include fish oil and animal fat (e.g. through dairy products) (Brickley et al 2014, Lewis 2007, Manchester and Roberts 2005). Rickets manifests skeletally in a couple ways. The softening of bone tissue as a result of uncalcified osteoid laid down on the growth plate disrupts the remodeling processes characteristic of growth and results in softened bones susceptible to bowing and twisting deformities (Brickley et al 2014, Lewis 2007). These disruptions in the remodeling process are also pathognomonic of osteomalacia, the adult version of the disease (Lewis 2007, Manchester and Roberts 2005). However, skeletal deformities are most often observed in juveniles, particularly those undergoing periods of rapid growth (Brickley et al 2014). Deficiency of this kind will more generally disrupt process of bone formation, leading to lower than expected levels of bone formation across the entire skeleton which, in turn, makes the individual highly susceptible to fractures if they survive birth, as well as a general retardation of growth processes (Brickley et al 2014, Lewis 2007, Manchester and Roberts 2005).

Effects of the disease observed on or within the subadult cranium are characterized by squared craniotabs on the side on which the infant lies, as result of pressure on the softened elements. Additionally, deposition of osteoid on the external table of the vault mimics porotic hyperostosis, and fontanelles may remain open until the third year. The disease also has the ability to mimic cribra orbitalia on the orbital roofs (Giuffra et al 2013). Enamel hypoplasia is another hallmark of rickets, and dental development is often delayed (Lewis 2007).

Neonatal death as a result of rickets is also not unheard of, resultant from birth complications owing to malformed limbs, and individuals who survive often show little evidence

of the condition as adults due to remodeling processes (Lewis 2007, Manchester and Roberts 2005). Manchester and Roberts (2005:174) argue that rickets is a hallmark of urbanization. For example, children of antiquity spent most of their time outside and were unlikely to contract rickets, whereas poor, underfed children who were living in dark, towering urban environments, often spending much of their time in factories during the initial stages of the Industrial Revolution, were more likely to experience vitamin D deficiency.

Scurvy:

Scurvy is the result of Vitamin C, or ascorbic acid, deficiency (Brickley and Ives 2006, Larsen 1997, Lewis 2007, Manchester and Roberts 2005, Mays 2008, Schwartz 2005). Vitamin C plays a major role in the proper formation and maintenance of collagen in bone, cartilage, and also the formation of teeth (Schwartz 2005). Unlike some other mammals, vitamin C cannot be produced internally by humans and other primates; it must be obtained through diet (Lewis 2007). Manchester and Roberts (2005) note that the availability of fresh fruits and raw vegetables may have been reduced during the transition to agriculture, owing to the cooking of foods and prolonged storage practices common in settled communities. Scurvy was common among soldiers and sailors prior to the 16th century, owing to long sea voyages. It was not recognized in children until the rise of urbanization; however, the skeletal lesions produced by scurvy were often masked by the lesions produced by rickets, making it difficult to detect except in more advanced cases (Lewis 2007).

Scurvy results in fragile capillaries and is marked by abnormal, chronic bleeding (Zuckerman et al 2014). It is through the excessive bleeding that produces lesions on the cranium and postcranial skeleton (Zuckerman et al 2014). It is manifest skeletally most often in the jaws and mouth, and metaphyseal ends of long bones, particularly in the legs. The periosteum,

particularly in the eye orbits. Diploic expansion may also cause resorption of the outer table, which may then cause or mimic porotic hyperostosis (Zuckerman et al 2014). Walker and others (2009) argue that most porotic hyperostosis in the new world is commonly caused by dietary deficiencies and malabsorption of vitamin B_{12} or folic acid. Mays (2008) notes that bleeding and swelling of the gums is highly characteristic of the disease that may eventually lead to inflammation of the alveolar bone and, leading to antemortem tooth loss. However, since these conditions are pathognomonic of other diseases besides scurvy; it may not be diagnosed by these lesions alone.

Influenza Pandemic (1918-1920):

One of the worst public health disasters ever observed globally and in the United States was the Spanish Flu pandemic of 1918 (Burg 2000, Gagnon et al 2013). The Spanish flu claimed the lives of more than 8,400 Wisconsin residents and afflicted over 100,000 people in Wisconsin alone. World-wide, the pandemic claimed more than 50 million people in just a few short months (Burg 2000). The pandemic attacked in three waves in the spring and fall of 1918 and in the winter of 1919 (Herring 1993). This H1N1 strain was notable for a number of reasons, chief among them being the sheer magnitude of the pandemic, the high mortality rate, but also the W-shaped age-at-death mortality profile (Noymer and Garenne 2000:2-3). Most influenza outbreaks have a U-shaped mortality curve because in such situations normally the very young and the very old are the most affected. In the case of the Spanish flu, the W-shape to the mortality curve is indicative of much higher than expected mortality rates among those in the prime of their lives between the ages of 20-50 years.

It is certainly possible that a population as immunocompromised as the current study suggests would have been susceptible to the Spanish Flu. However, the mortality curve

suggested by the current analysis is heavily weighted to the very young (Jeske and Strange 2017) and does not fit the W-shape of the of the mortality curve of the pandemic, in which older children and young adults were contaminated just as much (if not more) instead of just the very young or very old. The strain was known to kill swiftly, and if the individuals within the Ss. Peter and Paul Parish sample perished as a result, it is highly unlikely that evidence of it would be manifest on the skeletal material. However, it is possible that individuals already immunologically compromised from other afflictions who succumbed to the Spanish flu may have done so (Jeske and Strange 2017).

Sampling Issues

The Ss. Peter and Paul Parish cemetery presents a highly unusual demographic pattern in which 104 out of 108 individuals excavated were identified as subadults. However, given that the excavated sample represents only a portion of the cemetery, an anomalous distribution due to sampling error is not altogether expected. The divergence from expectation is so wide that it can be inferred that this portion of the cemetery may have been reserved for individuals who died in unusual fashion, or whose circumstances were related in some way.

It is possible that the deaths of children in rapid succession may account for the spatial arrangement, as well as for the cases of multiple interments within single burials. The answer may also be that the Commonwealth excavations happened to coincide with an area of the cemetery that was reserved for children to begin with. Evidence contradicting the notion of a children's section is, of course, the presence of the four adults, particularly that of individual 33a, who is buried in the midst of the rest of the children and is the only adult within that area. Furthermore, the presence of a segregated juvenile section is not seen in many 19th century

cemeteries in the Great Lakes region (McKillop 1995). However, Richards' (1997:112-114) analysis of the MCPFC suggests that the segregation of subadults into an "infant" cemetery within a larger context is not unusual, and that the pattern is not predicated upon local epidemics or even the Spanish Flu pandemic of 1918.

The popular view of childhood death changed through time in the New World. Placement of children's graves may be related to aspects of wealth and status (e.g. Meyer 1993), but can also reflect how the community viewed children (Sloane 1991). Sloane (1991:72-73) points out that children's cemeteries were beginning to appear more during the rural cemetery movement and that the emphasis on children's graves had become a focal point of the family and new conceptions of death, through which children were viewed and revered as the pinnacle of innocence and purity. Cannon and Cook (2015) suggest that anthropologists have yet to develop a solid theoretical basis in terms of how and why children are buried in any particular manner. They argue that status, wealth, and infant mortality rates have little to no influence on the spatial arrangement of children, instead suggesting that perhaps psychological factors, social mores, and family size may have more of an influence.

Summary of Ss. Peter and Paul Parish Cemetery:

There are several conclusions that can be derived from the analysis of the Ss. Peter and Paul Parish cemetery based upon the osteological evidence. First, the layout of the Ss. Peter and Paul Parish cemetery (Figure 3.8) suggests it may be a holdover of the old rural cemetery as much of the country to the east was likely already transitioning to the lawn-park cemetery. First wave immigrant populations tended to resist these mainstream changes and maintain the rural cemetery as a marker of their identity (Kiest 1993, Sloane 1991), and this notion is supported by

the spatial and historical documentary evidence. Second, this portion of the cemetery represents either an anomalous portion of the community population (Jeske and Strange 2017), perhaps aided by childhood deaths occurring in quick succession, or is a purposefully segregated children's section of the overall cemetery. Roller's (2016:81-84) spatial analysis indicates that the arrangement of subadult graves fits within the established pattern of the overall cemetery and that these individuals were likely recognized members of the church. However, the arrangement of the adults to the north contra the established pattern may indicate that these individuals had fallen out of good standing with the church. Third, though the sample is small, based upon the observation of pathologies such as Schmorl's nodes and arthritis it seems that life in Independence during this time was active and perhaps somewhat hard.

Figure 3.8: SSPP Cemetery Sectional-Layout (Roller 2016)

Finally, the subadult population was likely under heavy dietary duress of some kind, owing to the incidence and distribution of porotic hyperostosis and cribra orbitalia. Infections of the middle ear may have been common, owing to the high incidence of small and large lytic

lesions noted near the mastoid process of the temporal bones (n=25, 25%). It is unclear whether these infections actually resulted in the death of these children or if they died as a result of larger issues in which the infection is symptomatic. Interpretations in terms of differential diagnosis are provisional at best, and the overall pattern of high incidences of mastoiditis as well as nonspecific lytic and blastic lesions is inconclusive, owing to the inherent difficulties of conducting paleopathological analyses on juvenile bone and the overall poor taphonomic condition of the remains themselves. It is possible that any of the diseases here are likely candidates; however, Rickets does not seem to play a heavy role in the pathological profile of this population, as just two (just under 2 %) individuals were observed with bowed or twisted limbs. Furthermore, life on the farm in Independence would suggest that exposure to sunlight was likely not an issue as it likely was in more urban environments. The patterns presented here are suggestive of a combination of factors related to the environmental, cultural, and biological milieu of Independence, Wisconsin at the turn of the 20th century.

Chapter 4: The 2013 Milwaukee County Poor Farm Cemetery Sample

A comparison of rural and urban cemeteries in Wisconsin at the turn of the 20th century is useful because the two environmental settings are subject to differential cultural and social factors that implicate distinctive risks. The urban setting of Milwaukee was subject to energizing processes of rapid growth and increased opportunities for those seeking to improve their lives (Dougherty 2011, Leavitt 1996). However, the negative aspects of population crowding, unventilated housing, inadequate sanitation gave rise to infectious diseases and lack of access to sources of nutrition and health care, particularly among the poor and indigent (Leavitt 1996). Populations situated in a rural setting, such as the individuals from Independence, were presumably at risk to differential factors. The Ss. Peter and Paul data can be compared to recently recovered data from the MCIG/Froedtert conducted by UWM-CRM (Richards et al. 2016).

Milwaukee County Poor Farm Cemetery #2

The first recorded burial of indigent and unidentified individuals on the Milwaukee County Grounds occurred in 1882 and the practice continued through 1974. The county grounds comprise four known cemetery areas (Figure 4.1), representing the burial of more than 10,000 individuals (Richards et al 2016). Cemeteries 1, 3, and 4 are located on the periphery of the grounds, while cemetery 2 happens to be located in one of the most densely utilized portions of the Regional Medical Center. Cemetery 2 has been disturbed multiple times since 1932 resultant from its placement within the grounds. The most recent of these disturbances have occurred in 1991-1992 and again in 2013 when recovery operations were conducted by Great Lakes Archaeological Research Center, Incorporated and the University of Wisconsin-Milwaukee

Cultural Resource Management firm (UWM-CRM), respectively. The material utilized as a comparative sample in this study is resultant from the 2013 recovery operations conducted by UWM-CRM.

Despite the seemingly diverse backgrounds of Milwaukee residents during the early 20th century, the city demographics are largely described as homogeneous when compared to other larger, industrial cities of the Midwest (Richards et al 2016). The notion is most likely owing to the fact that German and, to a lesser degree, Polish individuals dominate the city's demographics. None the less, a wide range of countries and culture areas are represented in the *Register of Burials* (Figure 4.2). Average age at death of individuals by listed sex interred in the MCPFC between 1900-1920 can be found on Figure 4.3.

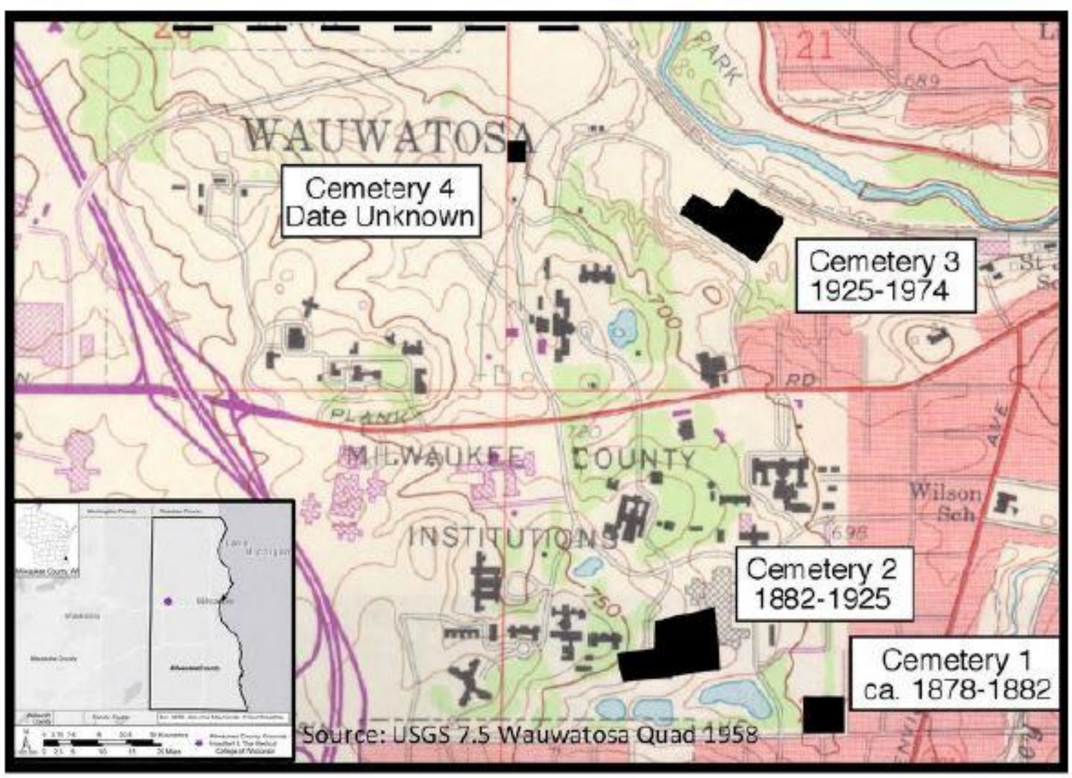

Figure 4.1: Locations of Milwaukee County Poor Farm Cemeteries (Richards et al 2016)

Overall, there are patterns within the documented burial population. Based upon documentary research, the overall age distribution of individuals interred at the MCPFC is heavily weighted toward those individuals of adult age and those of perinatal age (Richards et al 2016:28, see figure 2.18). Conversely older children and adolescents represent only 1.8% of all the documented interments. Sex is another important variable. The preadolescent age groups are fairly evenly represented between the sexes, while the age categories including adolescent and older are dominated by males. Females make up only 14% of individuals that fall within these categories. Death certificates were able to provide information on marital status for roughly 71% of the adult interments. The proportion of married women

Country	Number of Individuals	Percent
USA	1380	46.6
Unknown	594	20.1
Germany	582	19.6
Ireland	74	2.5
Austria/Austria-Hungary	70	2.4
Poland/"Poland Russia"	37	1.2
Canada	32	1.2
Norway	31	1
England	23	0.8
Russia/"Russia Poland"	20	0.7
Switzerland	19	0.6
Bohemia	17	0.6
Denmark	13	0.4
Sweden	12	0.4
Hungary	10	0.3
Holland	9	0.3
Scotland	8	0.3
France	5	0.2
Italy	5	0.2
Finland	5	0.2
Wales	3	0.1
Saxony	3	0.1
Mexico	2	0.1
Macedonia	2	0.1
Prussia	1	0
Turkey	1	0
"Czecho Slovakia"	1	0
"Slavenia"	1	0
Bavaria	1	0
"Europe"	1	0
TOTAL	2962	100

*from death certificates or coroner's reports of cemetery interments

Figure 4.2: Country of birth for individuals buried in the MCPFC, 1882-1910 (Richards et al 2016)

is higher than unmarried women in the young, middle, and old adult age categories (Richards et al 2016, see Figure 2.22). Single males, on the other hand, much more frequently represented than other marital statuses among the young and middle adult age categories (Richards et al 2016:29, see Figure 2.23).

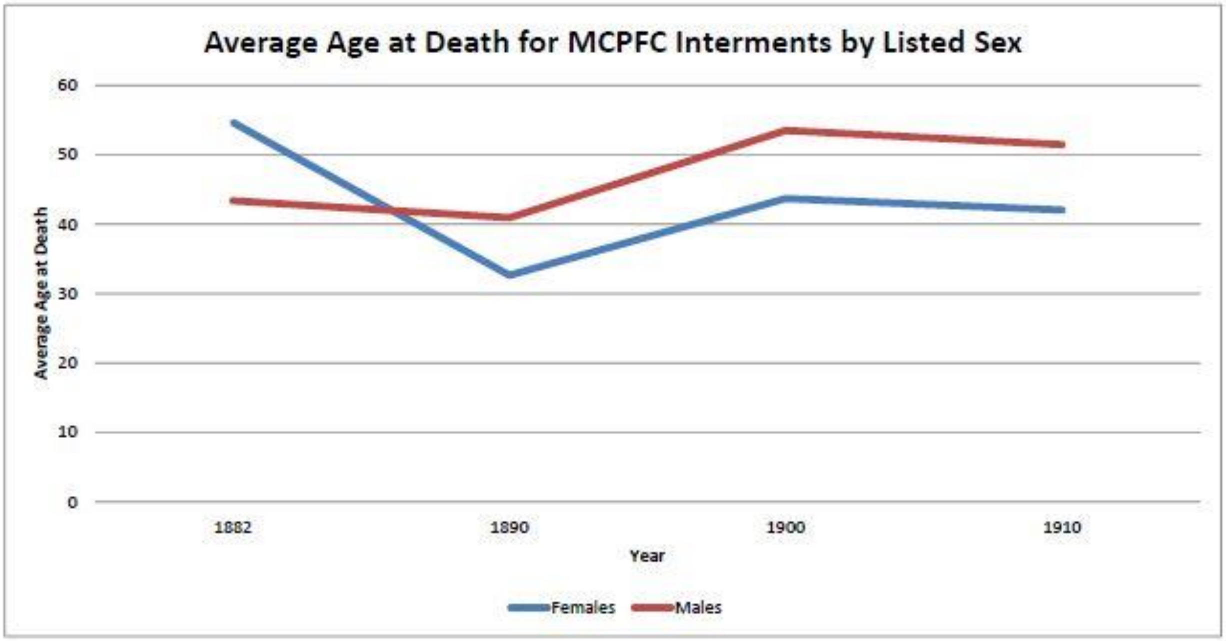

Figure 4.3: MCPFC Average age at death (Richards et al 2016)

Information regarding cause of death also reveals an obvious pattern. Medical deaths, including those occurring as a result of infectious disease, account for 76% of the sample with recorded COD information, while traumatic deaths occurring as a result of accident, suicide, or interpersonal violence make up a much smaller percentage (Richards et al 2016:30). Figure 4.4 illustrates the full distribution of COD among the documented population of cemetery 2. Specifically, death as a result of infection represents 30% of the overall sample. Diseases categorized as contributing to an infectious medical COD include diphtheria, influenza, syphilis, measles, pneumonia, small pox, tuberculosis, and typhoid fever (Richards et al 2016:31). The

most commonly occurring disease contributing to COD is, by far, tuberculosis. This affliction represents 15% of those killed by disease. Figure 4.5 provides a full listing of infectious diseases contributing to the COD of the sample.

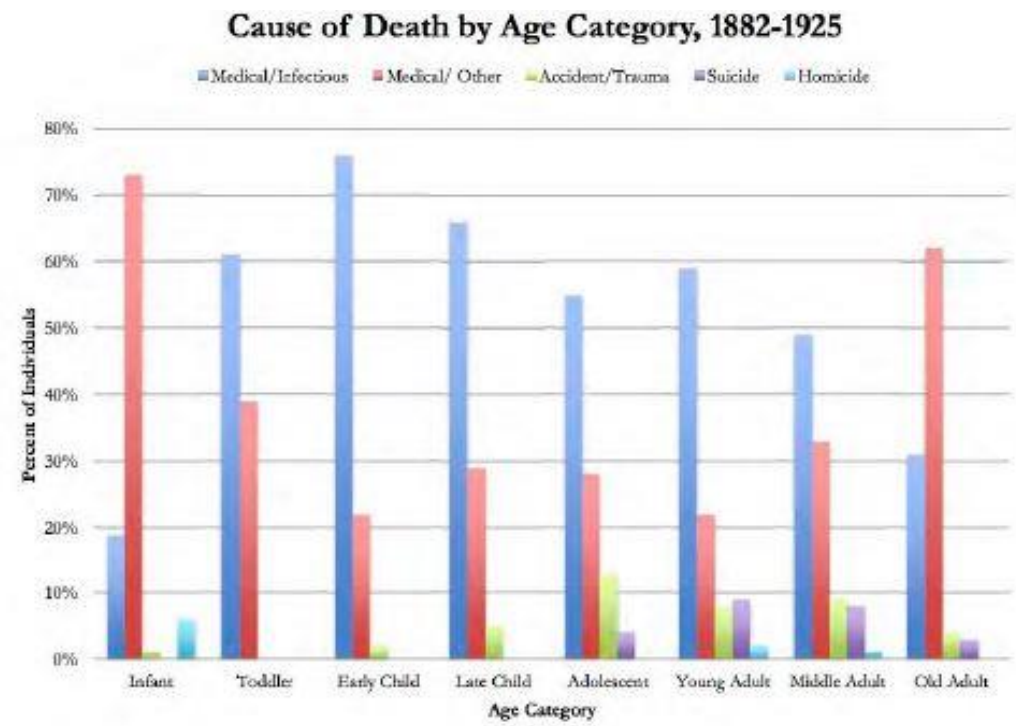

Figure 4.4: MCPFC Cause of Death by Age Category (Richards et al 2016)

Overall, these various lines of evidence present a clear pattern. The cultural make-up of Milwaukee during the early 20th century reflects more closely the pattern of ethnic backgrounds observed in the cemetery documentation. While Milwaukee could be considered rather homogeneous compared with other major industrial centers in the Midwest, owing to the high proportion of Germans and Poles in the documentation, the city can still be described as being extremely heterogeneous in terms of the sheer number of ethnicities represented. Single white males are the most prominent demographic within the adult age categories. The overall mortality pattern in which the young or the old are most often represented within the cemetery

documentation. Finally, medical and infectious issues are by far and away the most common cause of death within the sample.

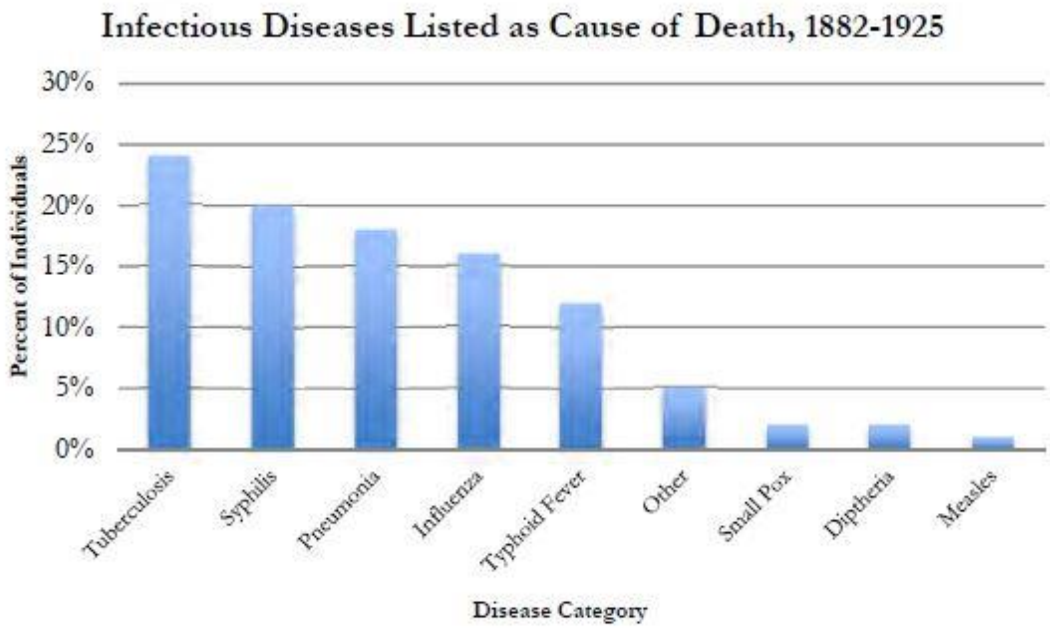

Figure 4.5: Infectious Diseases Listed as Cause of Death, 1882-1925 (Richards et al 2016)

Chapter 5: Comparing the Two Cemeteries: Discussion and Conclusions

Age categories from each site were reorganized in order to facilitate the comparative tests resultant from the slightly differential age categories utilized in each analysis (see Jeske and Strange 2017, see also Richards et al 2016). The categories were arranged into fetal, infant, and child classifications.

The Ss. Peter and Paul cemetery sample collapsed the following categories: Fetal and fetal-perinate individuals were classified as Fetal. The infant-perinate and infant categories were classified as Infant. The child category remained as is through the initial analysis. The MCPFC sample was collapsed into the following categories: neonates, infants, and toddlers were classified as Infant. Individuals classified into the early and late child categories were placed into the Child category. The MCPFC fetal category did not need to be adjusted. The collapsed categories will not only facilitate and make possible the comparative analysis, but will also make the results more meaningful by increasing the sample size within each age demographic. Conversely, the results will be less precise. However, the sacrifice of precision, again, will make the results more accurate.

The age ranges produced by collapsing the categories in this manner are not exactly isomorphic, but the differences are slight enough that should be reasonably comparable (Table 5.1).

Table 5.1: Definition of Collapsed Age Categories			
	Fetal Category	Infant Category	Child Category

Ss. Peter and Paul	Fetal + Fetal Perinate (Up to 40 weeks gestation)	Infant + Infant Perinate (Birth to 3 years)	Child (3-12 years)
MCPFC	Fetal (Up to 40 weeks gestation)	Neonate + Infant+Toddler (Birth to 2.49 years)	Early child + late child (2.5-12.9 years)

Comparison of Pathologies

Statistical comparisons of pathological indicators were conducted based upon observed presence and absence of incidences within each collapsed age category. Any pathology observed within the subadult sample of the Ss. Peter and Paul Parish (SSPP) cemetery were compared. These include primarily porotic hyperostosis, cribra orbitalia, and osteolytic and osteoblastic nonspecific lesions. However, twisting of long bones was observed only within the infant category within the Ss. Peter and Paul Parish sample; as such, only the infant category was compared in relation to this pathological indicator (Table 5.2).

Table 5.2: Frequencies of Pathology Across All Age Categories

	Pathology Present N /Row%	Pathology Not Present N /Row%	Total
SSPP	51/49%	53/51%	104
MCPFC	167/78%	47/22%	214
Total	218	100	318

Chi-Square=27.30, df=1, p-value<0.0001, Fisher Exact< 0.0001

Fetal Pathology

The comparison between the two sites indicates that fetal pathology is significantly higher at MCPFC than at SSPP, with a Chi-Square probability of greater than .0001 (Table 5.3).

The pattern is reinforced by looking at the proportion tables. There is a much higher rate of observed pathology among fetuses in the MCPFC sample (68%) versus what we see at SSPP (25%).

Table 5.3: Frequency of Fetal Pathologies, SSPP/MCPFC			
	Present N /Row%	Not Present N /Row%	Total
SSPP	5/25%	19/75%	24
MCPFC	39/68%	18/32%	57
Total	44	37	81
Chi-Square =15.4, 1 df., p>.0001			

Porotic Hyperostosis

The comparison between the two sites indicates that the pattern of porotic hyperostosis is statistically insignificant (Table 5.4). The unadjusted Chi-Square probability of 0.183 and the probability of the Fisher Exact Test equals 0.313. It is still worth noting that there were no cases of porotic hyperostosis at SSPP and more than 7% at MCPFC. While small sample size makes any firm conclusions about real work significance problematic, the pattern of higher rates of pathologies at MCPFC continues.

Table 5.4: Frequency of Fetal Porotic Hyperostosis, SSPC/MCPFC			
	P.H. Present N/Row%	P.H. Absent N/Row%	Total
SSPP	0/0%	24/100%	24
MCPFC	4/7%	53/93%	57
Total	4	77	81
Chi-Square =1.772, 1 d.f., p>.18, Fisher exact =.313			

Cribra Orbitalia

The comparison between the two sites indicates that the pattern of cribra orbitalia is statistically insignificant (Table 5.5). The unadjusted Chi-Square probability of 0.18 and the probability of the Fisher Exact Test equals 0.578. In this case, cribra orbitalia is twice as prevalent at SSPP than MCIG. However, as with porotic hyperostosis, sample size makes any statement of real-world significance problematic.

Table 5.5: Frequency of Fetal Cribra Orbitalia, SSPC/MCPFC			
	P.H. Present N/Row%	P.H. Absent N/Row%	Total
SSPP	2/8%	22/92%	24
MCPFC	2/4%	55/96%	57
Total	4	77	81
Chi-Square =0.837, 1 df., p= .386, Fisher Exact p.= 0.577914818			

Lytic Lesions

The comparison between the two sites indicates that the pattern of lytic lesions is statistically insignificant (Table 5.6). The unadjusted probability that the distribution is random equals 0.349, and the adjusted Fisher Exact Test p-value equals 0.405. The real-world pattern of lytic lesions indicates, however, that the MCPFC sample is subject to greater risk of incidence of these lesions.

Table 5.6: Frequency of Fetal Lytic Lesions, SSPC/MCPFC			
	Lytic Present N/Row%	Lytic Absent N/Row%	Total
SSPP	4/17%	20/83%	24
MCPFC	15/26%	42/73%	57
Total	19	62	81
Chi-Square=0.88, 1 df,, p=0.349, Fisher Exact= 0.405			

Blastic Lesions

The comparison between the two sites indicates that the pattern of lytic lesions is statistically significant (Table 5.7). The unadjusted probability that the distribution is random equals 0.028 and the Fisher Exact value is 0.029. This revelation is unsurprising, as there were zero incidences of blastic lesions among the SSPP fetal sample. Blastic lesions are clearly much more associated with risks at the MCPFC site.

Table 5.7: Frequency of Fetal Blastic Lesions, SSPC/MCPFC			
	Blastic Present N/Row%	Blastic Absent N/Row%	Total
SSPP	0/0%	24/100%	24
MCPFC	10/18%	47/82%	57
Total	10	71	81
Chi Square=4.8, df=1, p-value= 0.028, Fisher Exact= 0.029			

Infant Pathology

The comparison between the two sites indicates that the pattern of general infant pathology is statistically insignificant (Table 5.8). The unadjusted probability that pathology rates between sites is random is less than 0.0001 and the probability produced by the Fisher Exact Test p-value also falls far below 0.0001. In terms of real-world significance, we see a pattern of much higher than expected incidence of pathology among the infant demographic at the MCPFC site.

Table 5.8: Frequency of Infant Pathology, SSPC/MCPFC			
	PRESENT N/Row%	ABSENT N/Row%	Total
SSPP	35/52%	32/48%	67
MCPFC	122/81%	28/19%	150
Total	157	60	217
Chi Square=19.6, df=1, p-value< 0.0001, Fisher exact< 0.0001			

Porotic Hyperostosis:

The comparison between the two sites indicates that the pattern of infant porotic hyperostosis is statistically insignificant (Table 5.9). The unadjusted probability that the incidence of porotic hyperostosis is random equals 0.509 and the Fisher Exact Test p-value equals 0.642. The real-world pattern is indicative, again, that the MCPFC individuals were at least somewhat more at risk of porotic hyperostosis.

Table 5.9: Frequency of Infant Porotic Hyperostosis, SSPC/MCPFC			
	P.H. PRESENT N/Row%	P.H. ABSENT N/Row%	Total
SSPP	6/9%	61/91%	67
MCPFC	18/12%	132/88%	150
Total	24	193	217
Chi Square=0.436, df=1, p-value= 0.509, Fisher Exact= 0.642			

Cribra Orbitalia:

The comparison between the two sites indicates that the pattern is insignificant (Table 5.10). The probability that the distribution of incidence of cribra orbitalia is random equals 0.551 and the Fisher Exact Test p-value equals 0.579. The real-world pattern is relatively even. It seems that cribra orbitalia affects both populations evenly within the infant category.

Table 5.10: Frequency of Infant Cribra Orbitalia, SSPC/MCPFC			
	C.O PRESENT N/Row%	C.O. ABSENT N/Row%	Total
SSPP	6/9%	61/91%	67
MCPFC	10/7%	140/93%	150
Total	16	201	217
Chi Square= 0.355, df=1, p-value= 0.551, Fisher Exact= 0.579			

Lytic Lesions

The comparison between the two sites indicates that the pattern is insignificant (Table 5.11). The probability that the incidences of cribra orbitalia is random equals 0.081, while the Fisher Exact Test p-value equals 0.099. Looking again at the pattern of the distribution, it is apparent that roughly half the infants interred in the Ss. Peter and Paul Parish cemetery are recorded with lytic lesions, while only roughly one third of the MCPFC infant population are recorded as such. An argument could be made that there is an observable real-world pattern in the distribution of these lesions. The Ss. Peter and Paul Parish cemetery does report a demonstrably higher rate of incidence of lytic lesions among infants.

Table 5.11: Frequency of Infant Lytic Lesions, SSPC/MCPFC

	LYTIC PRESENT N/Row%	LYTIC ABSENT N/Row%	Total
SSPP	33/49%	34/51%	67
MCPFC	55/37%	95/63%	150
Total	88	129	217

Chi Square= 3.044, df=1, p-value=0.081, Fisher Exact= 0.099

Blastic Lesions

The comparison between the two sites indicates that the pattern is significant (Table 5.12). The unadjusted probability that the pattern is random is less than 0.0001 and the Fisher Exact Test p-value also is less than 0.0001. The pattern that presents itself indicates that there is a much higher rate of incidence concerning blastic lesions among the MCPFC infants (27%).

Table 5.12: Frequency of Infant Blastic Lesions, SSPC/MCPFC

	BLASTIC PRESENT N/Row%	BLASTIC ABSENT N/Row%	Total
SSPP	2/3%	65/97%	67
MCPFC	40/27%	110/73%	150

Total	42	175	217
Chi Square=16.64, df=1, p-value< 0.0001, Fisher Exact< 0.0001			

Twisted Limbs

The comparison between the two sites indicates that the pattern is significant (Table 5.13). The incidence of twisted limbs, though based on limited numbers, indicates a higher rate of pathology at SSPP. The initial indication is that the rate of twisted limbs between sites is significant, at p=.03, but the Fisher Exact Test p-value equals 0.094. How much value we can place on two examples from SSPP versus no examples from MCPFC is unclear. But it is worth noting that the sample sizes for this group are not small, and the lack of twisted limbs at MCPFC is interesting in and of itself.

Table 5.13: Frequency of Infant Twisted Limbs, SSPC/MCPFC			
	TWISTING PRESENT N/Row%	TWISTING ABSENT N/Row%	Total
SSPP	2/3%	65/97%	67
MCPFC	0/0%	150/100%	150
Total	2	215	217
Chi Square= 4.52, df=1, p-value=0.034, Fisher Exact= 0.094			

Early/Late Childhood

The comparison between the two sites indicates that the pattern is highly insignificant (Table 5.14) The unadjusted probability that the distribution is random is 0.948 and the Fisher Exact Test p-value equals 1.0. These results indicate that the distribution of pathology within the child age-category is nearly purely random and that there is no significant pattern. However, it should be noted that the sample sizes for this category are very small.

Table 5.14: Frequency of Childhood Pathology, SSPC/MCPFC

	PRESENT N/Row%	ABSENT N/Row%	Total
SSPP	11/85%	2/15%	13
MCPFC	6/86%	1/14%	7
Total	17	3	20
Chi Square= 0.00043, df=1, p-value=0.95, Fisher Exact= 1.0			

Porotic Hyperostosis:

The comparison between the two sites indicates that the pattern is insignificant (Table 5.15). The unadjusted probability that the distribution is random equals 0.212, and the probability produced by the Fisher Exact Test equals 0.27. The result is unsurprising given the sample size and the wide definition of the age range.

Table 5.15: Frequency of Childhood Porotic Hyperostosis, SSPC/MCPFC			
	P.H PRESENT N/Row%	P.H. ABSENT N/Row%	Total
SSPP	1/8%	12/92%	13
MCPFC	2/29%	5/71%	7
Total	3	17	20
Chi Square= 1.56, df=1, p-value= 0.21, Fisher Exact= 0.27			

Cribra Orbitalia

The comparison between the two sites indicates that the pattern is highly insignificant (Table 5.16). The unadjusted probability that the distribution is random equals 0.101, and the Fisher Exact Test returned a probability value of 0.249. It is worth noting that there are no incidences of cribra orbitalia among MCPFC individuals falling into the child category. Again, small sample size and definitional age range issues temper any conclusions.

Table 5.16: Frequency of Childhood Cribra Orbitalia, SSPC/MCPFC			
	C.O. PRESENT N/Row%	C.O. ABSENT N/Row%	Total

SSPP	4/31%	9/69%	13
MCPFC	0/0%	7/100%	7
Total	4	16	20
Chi Square= 2.69, df=1, p-value=0.101, Fisher Exact=0.249			

Lytic Lesions:

The comparison between the two sites indicates that the pattern is insignificant (Table 5.17). The probability that the distribution is random equals 0.589, and the Fisher Exact Test probability equals 0.651. The real-world pattern appears relatively similar in proportion.

Table 5.17: Frequency of Childhood Lytic Lesions, SSPC/MCPFC			
	LYTIC PRESENT N/Row%	LYTIC ABSENT N/Row%	Total
SSPP	9/69%	4/31%	13
MCPFC	4/57%	3/43%	7
Total	13	7/	20
Chi-Square= 0.29, df=1, p-value=0.589, Fisher Exact=0.651			

Blastic Lesions

The comparison between the two sites indicates that the pattern is insignificant (Table 5.18). The unadjusted probability that the distribution is random equals 0.162, and the Fisher Exact Test p-value equals 0.35. It is worth noting that there are no incidences of blastic lesions at the SSPP site within this age group. Nonetheless, the distribution of blastic lesions does not appear to produce a significant pattern among children between the two sites.

Table 5.18: Frequency of Childhood Blastic Lesions, SSPC/MCPFC			
	BLASTIC PRESENT	BLASTIC ABSENT	Total
SSPP	0/0%	13/100%	13
MCPFC	1/17%	6/86%	7
Total	1	19	20
Chi Square= 1.95, df=1, p-value= 0.162, Fisher Exact=0.35			

Comparison of Long Bone Lengths

The statistical two-tail T-Test utilizing two samples assuming unequal variances is utilized for the comparison of long bone lengths between the two sites. The null hypothesis tested against holds that the long bone lengths of subadults from either site is not significantly larger than the other. A significant probability value resulting from the test indicates that the observed pattern of long bone lengths from one site are indeed demonstrably larger than the other. Tests were run for each long bone within each age demographic. Long bones were measured in millimeters through the analysis of both sites. Please note that there were no T-Tests performed within the child demographic for the tibia as there were no observable cases within the MCPFC sample. Similarly, there is no comparison among fetuses or children utilizing the fibula; no observable cases represented the Ss. Peter and Paul sample in the case of the fetuses, and only one observation was possible among the MCPFC for the child category.

Ulna:

Fetal:

The result of the two-tail T-test comparing fetal ulna lengths does not appear significant (Table 5.19). The probability that ulna lengths are not larger at one site equals 0.68. The disparity in number of cases should be noted as having a possible effect on the comparison. Still, the means of the bone lengths are quite close together, which indicates no significant differences between fetal ulnar lengths.

Table 5.19: Fetal Ulna Comparison	*MCPFC-FETAL*	*SSPP-FETAL*
Mean	51.69867925	50
Variance	44.52793091	18
Observations	53	2
Hypothesized Mean Difference	0	

df	1	
t Stat	0.541515047	
P(T<=t) one-tail	0.342021046	
t Critical one-tail	6.313751515	
P(T<=t) two-tail	0.684042092	
t Critical two-tail	12.70620474	

Infant:

The mean ulna length among infants from the Ss. Peter and Paul cemetery is larger than those from the MCPFC, but the relatively small sample from SSPP affects the statistical probability (Table 5.20). The two-tail probability of 0.12 indicates that we cannot regard the difference with a high degree of confidence.

Table 5.20: Infant Ulna Comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	65.80903226	79.9
Variance	134.4133624	265.05
Observations	31	5
Hypothesized Mean Difference	0	
df	5	
t Stat	-1.860756641	
P(T<=t) one-tail	0.060926117	
t Critical one-tail	2.015048373	
P(T<=t) two-tail	0.121852234	
t Critical two-tail	2.570581836	

Early/Late Child

The ulnar comparison among individuals of childhood age shows larger bones at MCPFC, however the result is statistically insignificant, at 0.46 (Table 5.21). The disparity in mean lengths between the two sites is likely due to two reasons: First, there are few observations possible from either site. Second, the age range of the collapsed child category combined with the small sample sizes can result in significant differences (e.g. two individuals ten years of age

compared against four individuals at six years of age). These parameters limit any inferences that could be made, despite the gap in mean ulna lengths.

Table 5.21: Child Ulna Comparison	*MCPFC-CHILD*	*SSPP-CHILD*
Mean	203	145.375
Variance	5408	124.2291667
Observations	2	4
Hypothesized Mean Difference	0	
df	1	
t Stat	1.101863316	
P(T<=t) one-tail	0.2345857	
t Critical one-tail	6.313751515	
P(T<=t) two-tail	0.4691714	
t Critical two-tail	12.70620474	

Radius:

The comparison of radial lengths among fetuses appears insignificant (Table 5.22). The probability that the radial lengths are not larger at one site equals 0.73. The mean radial lengths are relatively similar, but there is a significant disparity in the number of possible observations. However, it should be noted that the Ss. Peter and Paul fetuses attained a higher mean bone length among only four cases, while the MCPFC site is much better represented but result in a lower average.

Fetal:

Table 5.22: Fetal Radius Comparison	*MCPFC-FETAL*	*SSPP-Fetal*
Mean	45.35283333	46
Variance	33.43352573	10
Observations	60	4
Hypothesized Mean Difference	0	
df	4	
t Stat	-0.370128399	
P(T<=t) one-tail	0.365025824	
t Critical one-tail	2.131846786	
P(T<=t) two-tail	0.730051648	
t Critical two-tail	2.776445105	

Infant:

The comparison of radial lengths among the infant demographic appears insignificant (Table 5.23). The probability that radial lengths are not larger at one site equals 0.546, with eleven degrees of freedom. The mean length of the Ss. Peter and Paul infant sample are nearly four millimeters longer but the disparity in number of cases makes the comparison insignificant.

Table 5.23: Infant Radius Comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	60.42081081	64.1666667
Variance	183.1621465	279.5
Observations	37	9
Hypothesized Mean Difference	0	
df	11	
t Stat	-0.624258297	
P(T<=t) one-tail	0.27259363	
t Critical one-tail	1.795884819	
P(T<=t) two-tail	0.545187259	
t Critical two-tail	2.20098516	

Early/Late Child

The comparison of radial lengths among the child demographic between the two sites, similarly, appears insignificant (Table 5.24). The probability that radial lengths are not bigger at one site equals 0.492. Again, the number of total cases and the disparity in number of cases between cemeteries were both factors influencing the result.

Table 5.24: Child Radius Comparison	*MCPFC-CHILD*	*SSPP-CHILD*
Mean	186.5	137.571429
Variance	4512.5	164.035714
Observations	2	7
Hypothesized Mean Difference	0	
df	1	
t Stat	1.024767259	
P(T<=t) one-tail	0.24610658	
t Critical one-tail	6.313751515	

P(T<=t) two-tail	0.492213159	
t Critical two-tail	12.70620474	

Humerus:

Fetal:

The comparison of humeral lengths among fetuses also appears insignificant (Table 5.25). The probability that humeral lengths are not larger at one site equals 0.75. We again see a large disparity in the number of observed cases. However, the means are also within a millimeter and half of one another. There do not appear to be significant differences in humeral length among fetuses.

Table 5.25: Fetal Humerus Comparison	*MCPFC-FETAL*	*SSPP-FETAL*
Mean	55.40173333	56
Variance	113.3468605	7.333333333
Observations	75	4
Hypothesized Mean Difference	0	
df	10	
t Stat	-0.327130549	
P(T<=t) one-tail	0.375156952	
t Critical one-tail	1.812461123	
P(T<=t) two-tail	0.750313904	
t Critical two-tail	2.228138852	

Infant:

The comparison of humeral lengths among infants does not appear to be significant (Table 5.26). The probability that humeral lengths are not larger at one site equals 0.889. There is some disparity in the numbers of observed cases, but the difference is not as great as previously observed in other tests. However, there is little difference in the mean humeral lengths between the samples. It is accepted that there is no pattern to the distribution.

Table 5.26: Infant Humerus Comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	76.691875	77.65384615
Variance	335.5083602	510.0576923
Observations	48	13
Hypothesized Mean Difference	0	
df	17	
t Stat	-0.141489351	
P(T<=t) one-tail	0.444573273	
t Critical one-tail	1.739606726	
P(T<=t) two-tail	0.889146546	
t Critical two-tail	2.109815578	

Early/Late Child

The comparison of humeral lengths among the child demographic does not appear significant (Table 5.27). The probability that humeral lengths are not larger at one site equals 0.461. There remains the issue of sample size and difference in size between samples, as well as the age definition of the category, but it is accepted that there is no statistical pattern to the distribution.

Table 5.27: Child Humerus Comparison	*MCPFC-CHILD*	*SSPP-CHILD*
Mean	241	180.5
Variance	5408	1042.416667
Observations	2	7
Hypothesized Mean Difference	0	
df	1	
t Stat	1.132689388	
P(T<=t) one-tail	0.23022123	
t Critical one-tail	6.313751515	
P(T<=t) two-tail	0.460442461	
t Critical two-tail	12.70620474	

Tibia:

Fetal:

The comparison of tibia lengths among the fetal demographic between the two sites does not appear significant (Table 5.28). The probability that the tibia lengths are not larger at one site than the other equals 0.547. The mean length of the MCPFC tibia sample is smaller, but there are far fewer cases representing the Ss. Peter and Paul sample. Regardless, the pattern is insignificant.

Table 5.28**:** Fetal Tibia Comparison	*MCPFC-FETAL*	*SSPP-FETAL*
Mean	54.36646154	55.7
Variance	87.93113885	15.7
Observations	65	5
Hypothesized Mean Difference	0	
df	8	
t Stat	-0.6291405	
P(T<=t) one-tail	0.273399027	
t Critical one-tail	1.859548038	
P(T<=t) two-tail	0.546798054	
t Critical two-tail	2.306004135	

Infant:

The comparison of tibia lengths among the infant sample between sites does appear to show a significant pattern (Table 5.29). The probability that tibia lengths will not be larger at one site equals 0.046. Here it is noted that the Ss. Peter and Paul infants have a demonstrably larger mean tibia length than that of the MCPFC infants.

Table 5.29: Infant Tibia Comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	76.38974359	97.07692308
Variance	426.0691026	1030.076923
Observations	39	13
Hypothesized Mean Difference	0	
df	15	
t Stat	-2.178665888	
P(T<=t) one-tail	0.022858497	

t Critical one-tail	1.753050356	
P(T<=t) two-tail	0.045716994	
t Critical two-tail	2.131449546	

Fibula:

Infant:

The comparison of fibular lengths among infants does not appear significant (Table 5.30). Fibular lengths are larger at SSPP, but the small sample size from SSPP results in a probability of 0.32. There is no pattern to the distribution of fibular lengths among infants.

Table 5.30: Fetal Fibula comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	66.64777778	100
Variance	222.5625359	648
Observations	18	2
Hypothesized Mean Difference	0	
df	1	
t Stat	-1.81852654	
P(T<=t) one-tail	0.160034485	
t Critical one-tail	6.313751515	
P(T<=t) two-tail	0.32006897	
t Critical two-tail	12.70620474	

Femur:

Fetal:

The comparison of femoral lengths among fetuses appears to be almost significant (Table 5.31). The probability that the femoral lengths are larger at one site equals 0.06, with fourteen degrees of freedom. The means are over four and a half millimeters apart, in favor of the Ss. Peter and Paul sample. However, there is a large disparity in number of observable cases. The

pattern is observable in real-world terms, though the probability just barely falls outside the realm of statistical significance.

Table 5.31: Fetal Femur Comparison	*MCPFC-FETAL*	*SSPP-FETAL*
Mean	61.32036145	65.875
Variance	124.6815913	28.125
Observations	83	8
Hypothesized Mean Difference	0	
df	14	
t Stat	-2.033277658	
P(T<=t) one-tail	0.030717754	
t Critical one-tail	1.761310136	
P(T<=t) two-tail	0.061435509	
t Critical two-tail	2.144786688	

Infant:

The comparison of femoral lengths among infants between the two sites also appears to be significant (Table 5.32). SSPP infant femoral lengths are larger than at MCPFC (p.= 0.032).

Table 5.32: Infant Femur Comparison	*MCPFC-INFANT*	*SSPP-INFANT*
Mean	89.32736842	114.3666667
Variance	786.6042469	1475.159524
Observations	38	15
Hypothesized Mean Difference	0	
df	20	
t Stat	-2.294923703	
P(T<=t) one-tail	0.016344709	
t Critical one-tail	1.724718243	
P(T<=t) two-tail	0.032689418	
t Critical two-tail	2.085963447	

Early/Late Child

The comparison of femoral length among individuals of childhood age does not appear significant (Table 5.33). The probability that femoral lengths will be larger at one site equals 0.467. The mean femoral lengths are skewed heavily in favor of the MCPFC sample but, again, this age demographic is plagued with the smallest sample sizes while the category itself is defined by the largest amount of years (about 3-13 years of age).

Table 5.33: Child Femur Comparison	*MCPFC-CHILD*	*SSPP-CHILD*
Mean	341	251.8333333
Variance	12482	1832
Observations	2	9
Hypothesized Mean Difference	0	
df	1	
t Stat	1.110723718	
P(T<=t) one-tail	0.233317486	
t Critical one-tail	6.313751515	
P(T<=t) two-tail	0.466634971	
t Critical two-tail	12.70620474	

Statistical Summary

The battery of statistical comparative tests revealed several significant results, and two insignificant results that are close enough to the ($p<0.05$) threshold. Chi Square test that returned results of significance include the following: Fetal and infant general pathology, fetal and infant blastic pathology, and infant twisted limbs. The infant lytic pathology test resulted in a probability that was very nearly significant, and a pattern is readily observable when the proportionate tables are consulted. The tests ran on the incidence of twisted limbs and the nearly significant test for lytic lesions among infants indicated higher rates for the Ss. Peter and Paul Parish cemetery. The general pattern presented indicates that fetuses and infants at the MCPFC

cemetery are vulnerable to higher incidences of pathology generally, and more specifically to diseases that are causing nonspecific blastic lesions.

The statistical two-tail T-Tests conducted on the osteometric long bone data revealed both significant and insignificant results. As expected, the comparisons of any long bone lengths among the child category did not return probability values of any significance. This failure in the analysis was likely due to a combination of small sample sizes, disparity in relative sample sizes, and a definitional age-range that is far too large and probably exacerbated the effects of the first two factors. However, there are observable patterns within the fetal and infant categories. The tests for the tibia and femur within the infant category returned significant results indicating that the Ss. Peter and Paul elements were larger for the age group. Furthermore, the test comparing ulnar lengths among infants returned a very nearly significant result, also indicating that the Ss. Peter and Paul sample is larger. The test comparing femurs fell just short of significance among the fetal group but it, too, indicated that the Ss. Peter and Paul sample is larger. Overall, the battery of tests indicates that younger subadults from the Ss. Peter and Paul Parish are larger and/or developing at a faster rate.

Discussion

The expectations I laid out for the statistical comparison between the Ss. Peter and Paul Parish cemetery and the MCPFC were two-fold:

1. It is expected that it will be found that the subadult individuals at the MCPFC will be found demonstrably more pathological than the subadults at the Ss. Peter and Paul Parish cemetery in terms of indicators of nutritional stress and non-specific osteolytic and osteoblastic lesions.

2. It is expected that subadults at the Ss. Peter and Paul Parish cemetery will be demonstrably larger than subadults from the MCPFC in terms of growth rates relative to age estimation.

In both cases, my expectations were confirmed, albeit only marginally so (Tables 5.34 and 5.35). Both batteries of tests returned significant results indicating that subadults from the MCPFC sample are more generally vulnerable to sickness and disease among the fetal and infant categories. It is also indicated that subadults from the Ss. Peter and Paul Parish sample were likely experiencing fewer disruptions in growth rate in terms of nutritional efficiency and, in all likelihood, susceptibility to sickness and disease. However, both batteries of tests were hindered by smaller sample sizes, particularly in the case of the Ss. Peter and Paul sample, and in many cases large disparities in sample sizes.

Table 5.34: Summary of Pathology Distribution

Condition	SSPP%	MCPFC%	Statistical Significance
Total Pathology	49%	78%	Yes
Fetal Pathology	25%	68%	Yes
Fetal Porotic Hyperostosis	0%	7%	No
Fetal Cribra Orbitalia	8%	4%	No
Fetal Lytic Lesions	17%	26%	No
Fetal Blastic Lesions	0%	18%	Yes
Infant Pathology	52%	81%	Yes
Infant Porotic Hyperostosis	9%	12%	No
Infant Cribra Orbitalia	9%	7%	No
Infant Lytic Lesions	49%	37%	Yes
Infant Blastic Lesions	3%	27%	Yes
Infant Limb Twisting/Deformity	3%	0%	No
Childhood Pathology	85%	86%	No
Childhood Porotic Hyperostosis	8%	29%	No
Childhood Cribra Orbitalia	31%	0%	No
Childhood Lytic Lesions			

Childhood Blastic Lesions	69%	57%	No

Table 5.35: Summary of Osteometric Long Bone Size Comparisons			
Long Bone	**MCPFC Mean**	**SSPP Mean**	**Statistical Significance**
Fetal Ulna	51.70	50.00	No
Fetal Radius	45.35	46	No
Fetal Humerus	55.40	56	No
Fetal Fibula	N/A	N/A	N/A
Fetal Tibia	54.37	55.70	No
Fetal Femur	61.32	65.88	No
Infant Ulna	65.81	79.90	No
Infant Radius	60.42	64.17	No
Infant Humerus	76.69	77.65	No
Infant Fibula	66.65	100.00	No
Infant Tibia	76.39	97.08	Yes
Infant Femur	89.32	114.37	Yes
Child Ulna	203	145.38	No
Child Radius	186	137.57	No
Child Humerus	241	180.5	No
Child Fibula	N/A	N/A	N/A
Child Tibia	N/A	N/A	N/A
Child Femur	341.00	251.83	No

A number of observations can be discussed. One potentially useful observation is that the Chi Square distribution test for infant and fetal blastic lesions returned significantly, to the detriment of the MCPFC sample. On the other hand, non-specific lytic lesions nearly returned as significant, while the Chi Square test of limb deformation did return significantly. Interestingly, while the Ss. Peter and Paul Parish sample indicated higher prevalence of limb deformity, observed in both cases among the femora, all significant comparisons of long bones (including femora) returned positively in favor of the church sample. Here, we can infer that, despite the individuals with shortened and twisted femora, subadults from the church sample were more

robust at an earlier age and grew at faster rates. It is also apparent that the two samples were likely suffering from similar pathogenic and nutritional circumstances on one hand, but the disparity in lytic versus blastic lesions indicates that the biocultural environment was not completely identical.

The disparity between non-specific lytic and blastic lesions among these samples is interesting. Blastic lesions are suggestive of pathologies such as cancer (Alt et al. 2002, Lieverse et al. 2014) and scurvy (Lewis 2007, Roberts and Manchester 2005), while non-specific lytic lesions can imply a host of pathological conditions including ear infections, treponemal disease, syphilis, and many others (Lewis 2007, Larsen 1997, Ortner and Putschar 1981, Schwartz 2007). A full differential diagnosis falls outside the scope of this thesis; however, a brief survey of other cemetery populations demonstrates how difficult the characterization of the complex web of sociocultural and biocultural factors leading to confidant inferences can be.

For example, Brickley and others (2014) argue that socioeconomic status and place of residence are strong determinants of nutritional deficiency. They found that the epidemiology of rickets in some developing countries in Africa, Asia, and the Middle East provided biocultural models indicating that lack of key resources has deleterious effect on the social patterning of this disease; that is, higher levels of rickets will be observed in skeletal collections from sites of low socioeconomic status. The model was further observed in their study of the Spring Street Presbyterian Church congregation cemetery, found in the context of the rapid urbanization of New York City in the mid to late 19th century. However, Giuffra and others (2013) found ample evidence of rickets in their study of high socioeconomic status subadults from the Medici family in Florence, Italy. The implication is that, while urban environments and lifeways have been implicated in vitamin D deficiency, a more complex web of sociocultural factors are involved in

the appearance of this condition. Environmental factors in and of themselves are inadequate explanations of the disease, as indicated by vitamin D deficiency observed among rural medieval peasants (Brickley et al. 2014).

Lewis (2011) found in her analysis of 165 subadults from the Romano-British Poundbury Camp (1st-3rd centuries A.D.) that 6.1% of the sample aged 3-15 years were identified with lesions suggestive of pulmonary infection, with 4.2% likely suffering from tuberculosis. Pathological insults observed include spinal lytic lesions, active blastic lesions on the ribs, and widespread periostitis on the long bones, dactylitis, and osteomyelitis of the mandible and scapula. Differential diagnoses for these patterns of lesions include afflictions such as brucellosis, bronchitis, pneumonia, Scheurmann's disease, scurvy, and others (Lewis 2011:15-16). However, diagnoses necessarily are dependent on the pattern of lesions; the presence of a single parameter of a given disease cannot on its own provide an accurate characterization. In this particular example, the extant spinal lesions are not indicative of brucellosis, despite the presence of goats, cattle, and pigs present at the site (Lewis 2011). Furthermore, none of the subadult skeletons exhibit evidence of lesions affecting the knees or hips, which is associated with brucellosis (Lewis 2007, Lewis 2011). Poor nutrition is also linked with tuberculosis as a good diet is inextricably linked with a healthy immune system. However, indicators of scurvy and rickets in association with cribra orbitalia and porotic hyperostosis are also observed in the form of non-specific lytic lesions, which may be attributed to deficiency in vitamins C and B_{12} derived from meat and dietary products. Aspects of urbanization such as overcrowding and a lack of adequate sanitation are frequently cited as culprits for the easy spread of tuberculosis; however, proximity to farm animals and occupations that result in heavy exposure to dust (e.g.

mining, potting, and textile work) are also known to give rise to respiratory infections (Lewis 2011).

Weaning and the health of mothers in relation to childhood mortality must also be considered. Infants have high nutritional requirements due to their rapid growth, which also indicates a limited tolerance for dietary deficiencies (Lewis 2007, Larsen 1997). Prior to birth, the growing fetus accumulates stores of vitamins and other vital nutrients (e.g. zinc, calcium) that are supposed to sustain them in the first few months of life (Lewis 2007). The premature status of the fetus reduces the amount of time the fetus has to accumulate these stores and will predispose it to deficiency diseases in the first few weeks of life. After birth, human breastmilk is relied upon to provide the infant with nutrients and immunological protections needed to survive (Lewis 2007, Larsen 1997).

Weaning refers to the process of changing the infant's diet from exclusively breastfeeding, typically around the 4-6 months of life range (Lewis 2007). At or around 6 months of age, breastfeeding no longer provides the infant with the vital nutrients needed for healthy growth (Lewis 2007, Larsen 1997). Early weaning (prior to the 4-month mark) is also dangerous, as the infant has not yet developed resistances to new microbes that may be introduced with the introduction of new foods, thus increasing the risk of infant mortality (Lewis 2007). The weanling's dilemma, then, is the notion that the infant must be weaned in order to continue a healthy growth cycle, yet, the process exposes the child to a number of bacterial and parasitic infections, potentially causing fatal diarrheal disease and malnutrition. These factors can lead to or exacerbate risk of infectious diseases of all kinds (Lewis 2007).

Chapter 6: Conclusions

It has been argued that patterns of infant mortality have the ability to provide the most powerful indices of the overall quality of life and state of a given community (Herring et al 1991, Lewis 2007). The pathological profile of any given population will be rooted in its own particular biocultural and environmental context. This biocultural and sociocultural fingerprint will produce a unique combination of factors that will influence different pathological vectors in different ways and, thus, patterns observed upon the human skeleton. Furthermore, the reliability of inferences of past lives applied to skeletal material is inseparable from the quality and quantity of preserved osseous material (Herring et al 1991). While there is ample extant skeletal material from both sites, the Ss. Peter and Paul Parish sample is smaller and, more importantly, heavily compromised in terms of taphonomy.

Potentially another confounding aspect facing analysts of human remains is referred to as the osteological paradox put forth by Wood and others (1992), which has not been embraced by all researchers (c.f. Cohen 1994). Prior to the publication of this influential paper, researchers interpreted osteological stress markers in a straight-forward way- the higher the frequency of pathological conditions, the higher average level of stress (Soltysiak 2015). However, this is perhaps not exactly the case. There are three key components to the osteological paradox (Wood et al 1992, Wright and Yoder 2003):

1. Demographic nonstationarity
2. Selective mortality
3. Hidden heterogeneity

Demographic nonstationarity refers to the notion that unless a population is of constant size, the age distribution of the skeletons in a cemetery reveals more about fertility than it does about mortality (Wood et al 1992, Wright and Yoder 2003). Selective mortality is indicative of the nation that the deceased are as such for a reason, which is self-evident. The abundance or pattern of lesions observed in a cemetery population does not represent a direct reflection of their abundance or pattern in the living population at any particular point in time (Wood et al 1992, Wright and Yoder 2003). Individuals have different experiences in terms of health and illness, and this history of health and illness will contribute to their entry into the cemetery population at a given age. This notion begs the question of whether or not a skeleton without evident lesions represents a healthy person or someone who perished at the first exposure to a pathogen (Wright and Yoder 2003). Hidden heterogeneity refers to individual frailty, or susceptibility to disease and illness. This variation can drastically affect aggregate comparisons of population of population health as the contributing factors are typically not identifiable (Cohen 1992, Wright and Yoder 2003). For example, Chitty and Altman (2002) have presented new size charts that incorporate increasing variability of long bone size with gestational age, indicating that younger fetuses may not express many differences in long bone size but more variability may become more apparent in later fetal ages.

Clearly, any inferences made must be carefully considered in light of the osteological paradox. Furthermore, when a skeletal series such as the Ss. Peter and Paul Parish sample is taphonomically altered to a significant degree, in which elements are badly damaged, obscured, or missing, finding meaningful patterns in pathological lesions is similarly compromised. Virtually all (circa 98%) of the subadult skeletons were composed of cranial and/or mandibular remains; almost none were largely complete post-cranially. Given this strong bias towards

taphonomic destruction, all conclusions about the individual and illness or trauma must be considered provisional.

Nevertheless, the current analysis does demonstrate that the subadult individuals that composed the Ss. Peter and Paul Parish sample are demonstrably larger by age category, and that the MCPFC subadults do seem to be more at risk to nutritional stress, sickness, and disease. In light of the considerations presented in this analysis, vitamin D deficiency seems to be a likely culprit that may compromise the development of subadult long bones among the MCPFC sample. In a highly urbanized and industrial environment, the lack of consistent absorption of vitamin D from sunlight may contribute to corresponding deficiencies among mothers. Mahon and colleagues (2010) found high correlation between the vitamin D status of mothers and the morphology of the developing femur. Correspondingly, Galthen-Sørensen and colleagues (2014) posit that little bone mineralization occurs before the third trimester, but that low maternal calcium intake may also limit fetal bone growth during this period. It may be the case that a combination of the physical built environment and lack of access to vitamin D resources among MCPFC mothers heavily compromised the subadult individuals interred in Wauwatosa.

The contributing factors that are responsible are largely rooted in the biocultural and sociocultural environmental contexts of the host populations at their particular places during the turn of the 20th century in Wisconsin- one group of homogeneous Poles in their rural farming community versus the highly-urbanized environment characterizing the Milwaukee County Poor Farm Cemetery. Richards (1997:291-292) concludes that the individuals of the MCPFC must be seen as more than a monolithic class of low-status paupers; these individuals are more correctly characterized as differing classes who arrived under the care of the institution as a result of drastically different circumstances, and that they are more accurately described as a reflection of

the greater population as whole. That is, these are not average paupers. On the other hand, the Poles of Independence are subject to a different set of challenges and are likely exposed to different sets of risks.

Future Research

This thesis illuminates the biocultural and environmental circumstances inherent in life at the Ss. Peter and Paul Parish. The undocumented cemetery was revealed and excavated as result of church renovation resulting in the recovery of these 108 individuals via cultural resource management consultation. Much more could be learned from this sample with methods not utilized with this study. Analyses involving isotope and genetic testing could provide additional insights into frailty in terms of disease and illness susceptibility and diet. It is worth noting that a large portion of interested community members were interested in conducting DNA analysis in the hope of individualizing as much of the remains as possible. Unfortunately, the cost of such testing is probative and proved too great an obstacle. On a personal level, it is gratifying as an archaeologist to have such inquisitive stakeholders in a project such as this one. However, this sample is scheduled to be reinterred in May of 2017 and will be unavailable for further research, in accordance with the wishes of related and interested community constituents. This study did, however, contribute to the growing literature regarding the biocultural circumstances of historic populations of Wisconsin during the late 19th and early 20th centuries.

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Appendix

Skeletal Analysis Summaries of Individuals from the Sts. Peter and Paul Cemetery

<u>Individual 1:</u>

Context: Individual 1 came from Burial 1. Burial 182 appears to truncate Burial 1, but there is no evidence of commingled remains.

Inventory: Cranial fragments, teeth, and fragments of the right humerus and radius are present. Several vertebral fragments exist. A number of deciduous and not fully-developed permanent teeth are present.

Age: Infant

Sex: N/A

Pathology: Lytic lesions of the endocranial surface of the occipital.

Taphonomy: Poor

Cultural Affiliation: Permanent central maxillary incisors are shovel-shaped. Due to the shovel shaped incisors it is possible that this individual may have at least one Native American or Asian ancestor. Shovel shaped incisors are present in 67% to 75% of Native American and northeast Asian populations, and in only 2% of European and 4% of African populations.

Summary:

Estimated age of death of the individual based on dental development is 3 years ± 12 months (Ubelaker 1979). A Moorrees value of 1.8-2.75 years old supports the Ubelaker estimate. Preservation is too poor to use bone fusion as a reliable indicator of age. Based on the dental data, we conclude that this individual was 2-3 years old at time of death.

The occipital endocranial surface shows a series of small lytic lesions indicating possible infection or inflammation of the meningeal membrane (Figure 1).

The individual may have had one or more Native American ancestors.

Figure 1. Individual 1, occipital; ectocranial bone loss and sclerotic build-up.

Individual 2:

Context: Individual 2 came from Burial 2.

Skeletal Inventory: Portions of all cervical, and most of the thoracic and lumbar vertebra, were recovered. Both 1st and 2nd ribs of both sides, the majority of the rest of the ribs, the shoulder and hip girdles also were found. Portions of the right and left humerus, femur, tibia and fibula are present. Feet and hand bones are missing.

Age: Infant

Sex: N/A

Pathology: Porotic Hyperostosis on frontals and barely discernable cribra orbitalia.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary

Preservation is poor, but both cranial and postcranial remains were recovered. Estimated age of death of the individual based on dental development is 2 years ± 8 months (Ubelaker 1979). A Moorrees value of the right m_1 yields an age of 2.2 years.

Overall, bone union indicates an age range of 1-4 years of age based upon fusion of mandible and frontals in union (Baker et al. 2005). The greater and lesser wings of the sphenoid are fused to the body. The

mandibular symphysis is fused. The frontal bones are in union, but the metopic suture is not closed. The temporals appear to have been in union with parietals. Based on a combination of dental and bone development data, we conclude that this individual was 2 to 2.5 years old at time of death.

The individual shows several pathologies, including bone loss of the occipital, cribra orbitalia (Figure 2) and lytic lesions of the temporal bones (Figure 3)

Figure 2: Individual 2, cribra orbitalia left frontal bone.

Figure 3: Individual 2, lytic lesions of the temporals, right and left.

Individual 3:

Context: Individual 3 came from Burial 3.

Skeletal Inventory: Fragments of the left frontal bone, both temporal bones, sphenoid, occipital mandible, three neural arches, and three unaided rib fragments.

Age: Infant

Sex: N/A

Pathology: Lytic lesions of cranial bones

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary

Preservation is poor (Stages 3-5). Estimated age of death of the individual based on dental development is 6 months ± 3 months (Ubelaker 1979). Moorrees values range from 0.46 (5 months)-to 0.67 years (8 months). Cranial bone union indicates first postnatal year: the petrous portions of the temporal bones appear to have been in union with temporal squama. The mandibular symphysis is in union and is nearly obliterated. The greater wing of the sphenoid is in union with the body (Baker et al. 2005).

Pathology of the temporal bone is characterized by pin-prick lytic lesions, particularly over the mastoid region. In addition there appear to be sclerotic lesions on the endocranial aspect of the occipital.

Individual 4:

Context: Individual 4 came from Burial 4.

Skeletal Inventory: Fragments of cranial bone, clavicle, scapula, vertebra and rib fragments, ilium, left humerus, right ulna, both femora both tibiae.

Age: Infant

Sex: N/A

Pathology: Possible, petrous portion of temporal.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary Bone preservation is very Poor (Stages 3-5), with vertebral centra and the occipital pars basilarus (usually among the better preserved elements) showing evidence of extreme weathering. Cranial vault is reduced to tiny fragments.

Based on dentition, estimated dental age is 9 months ± 1.5 months (Ubelaker 1979). No Moorrees value is possible. The little bone union data observable is in agreement with the Ubelaker estimate. The mandibular symphysis is in union, while vertebral neural arches are not in union, suggesting first year of life.

The pathology noted on the petrous portion of the temporal is only tentatively identified due to extensive weathering of the bone.

Individual 5:

Context: Individual 5 came from Burial 5.

Skeletal Inventory: Cranial bones, left clavicle, both scapulae, left ulna, both femora, some cervical and thoracic vertebrae, rib fragments.

Age: Infant-Perinate

Sex: N/A

Pathology: None

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary

Preservation is poor, with missing bone and weathering (Stages 2-5) on remainders. Based on dentition, the estimated age at death is birth ± 2 months (Ubelaker 1979). No Moorrees value possible. Bone development data support the dental estimate. The frontal bones are not in union and the mandibular symphysis is open. The petrous portions of the temporal do not appear to have been in union with squama. No tympanic rings are present. The morphology of the petrous portion indicates that the individual was at least 40 weeks in utero. We conclude that this individual died shortly before or after birth.

Individual 6:

Context: Individual 6 came from Burial 6.

Skeletal Inventory: Mandible, occipital, and parietals; both clavicles and scapulae, neural arches of cervical, thoracic and lumbar vertebrae, sacrum, sternal bodies, both 1st and 2nd ribs, ribs and rib fragments, portions of all limb bones, foot and hand bones.

Age: Infant

Sex: N/A

Pathology: Cary Rm_1

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary

Preservation is very differential (Stages 1-5), but overall fair. Cranial bones affected the most.

Based on dentition, the estimated age at death is 3 years ± 12 months (Ubelaker 1979). Bone union agrees with this estimate. The occipital and parietals are in union at the lambdoidal sutures. Thoracic vertebral neural arches are in union, while lumbar neural arches are in partial union and cervical neural arches are not in union, indicating an age of at least 2 years (Baker et al 2005).

Size comparison of long bone illustrations in Baker et al. (2005) indicates an age over 1.5 years, but under 5 years. Primeau et al. (2016) quadratic equations indicate age ranges of 2.2 years ± 1.31 years (humerus), 2.2 years ± 1.49 years (radius), 2.41 years ± 1.39 years (tibia) and 3.8 years ± 1.34 years (femur). Taken together, the results from Primeau et al. support the dental age estimation of 3 years ± 12 months.

Both of the individual's femora appear to be bowed and twisted. Bowing of the limbs (as well as porosity of the cranial and some long bones) may be related to rickets, but there are other factors that can lead to bowed conditions (Mays et al. 2006:364-366).

<u>Individual 7:</u>

Context: Individual 7 came from Burial 7.

Skeletal Inventory: Mandible, occipital, and parietals, temporals, sphenoid, zygomatics, maxillae. Both clavicles and scapulae; neural arches of cervical, thoracic and lumbar vertebra, three sacral vertebra, manubrium and sternal bodies, both 1st and 2nd ribs, ribs and rib fragments, portions of all limb bones except the fibulae, some right carpals and phalanges.

Age: Infant

Sex: N/A

Pathology: Endocranial lytic lesions of the parietals.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary Bone preservation is fair (Stages 2-4) with moderate weathering on bones that were recovered.

All teeth present are articulated. Dental data suggests an age at death of 1year ± 4 months (Ubelaker 1979). Schwartz's (2007:162) description of mandibular fusion indicates an age of 18 months +/- 6 months. The greater wings of the sphenoid are fused to the body. The mandibular symphysis is also fused. Both petrous portions are fused to the temporal squama. The dens is present on the second cervical vertebra. Taken together, these indicators support an assessment of an age between 1-2 years at death.

The lytic lesions on the interior of the parietals are somewhat patchy but are clear and distinct.

<u>Individual 8:</u>

Context: Individual 8 came from Burial 8.

Skeletal Inventory: Cranium and mandible, except for zygomatics and right maxilla. Left clavicle, both scapulae. Both ilia and ischia, left pubis. Seven cervical, 11 thoracic, and four lumbar vertebrae. Both 1st and right 2nd ribs, four left and five right ribs. Both humeri, left radius, both femora, both tibiae, 1 unsided metacarpal and 4 unsided carpal phalanges.

Age: Infant

Sex: N/A

Pathology: Possible lesions of the temporals.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary: Preservation is relatively poor but variable. For example, the thoracic and lumbar neural transverses are highly fragmented and individually unidentifiable, with 30 total fragments representing a total of 15 thoracic and lumbar neural arches. However, the left humerus and right femur were complete enough for us to take length measurements.

Tooth data suggests an age at death of 9 months ± 3 months (Ubelaker 1979). A Moorrees value of 0.92 on the 2nd molar supports the Ubelaker estimation. Long bone measurements of left humerus and right femur suggest an age of 6-7 months (Primeau et al. 2016). Overall development of cranial bone union suggests an age consistent with the latter half of the first year.

We noted possible pathology on the temporals but it is difficult to ascertain with certainty due to oddly symmetrical erosion patterns expressed by each squama. It is suspicious but not enough to code.

<u>Individual 9a:</u>

Context: Individual 9a came from Burial 9. It was commingled with Individual 9b.

Skeletal Inventory: Portions of most of the cranial bones, mandible, left clavicle, both scapulae; 6 cervical, 11 thoracic, 2 lumbar vertebrae; portions of all upper limb bones, tibia, metatarsal and phalanges fragments.

Age: Infant

Sex: N/A

Pathology: None noted.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary: Individual 9a appears to have been the primary individual in this burial. Most skeletal elements were intact and relatively well preserved for a child of this age (weathering scores from the *Standards* ranged from 2-5). Oddly, both femora were missing. There were also tarsals and phalanges present on both sides, but no evidence of carpals or phalanges associated with the hands.

Tooth development suggests an age at death of 9 months ± 3 months (Ubelaker 1979). A Moorrees value of 0.61 on the 1st molar supports the Ubelaker estimation. Measurement of the left tibial length suggests an age of 1 year +/- 1.53 years (Primeau et al. 2016). The mandibular symphysis is in union. The petrous portions of the temporals are in union with squama. The greater wings of the sphenoid are in union with the sphenoid body. The foreman ovale on the greater wing of the sphenoid is closed. As a whole, these measures indicate an age of death between 6 months and a year.

Individual 9b:

Context: Individual 9b came from Burial 9. It was commingled with Individual 9a.

Skeletal Inventory: Most of the cranial bones present except for parietals and mandible. Right clavicle, both scapulae, seven cervical, 10 thoracic, three lumbar vertebrae. Portions of 1st and 2nd ribs (both sides) although most ribs were too fragmentary to identify. Portions of the innominates, portions of all upper limb bones, both femora, metacarpal and phalanges fragments. Tibiae and fibulae missing.

Age: fetal

Sex: N/A

Pathology: None noted.

Taphonomy: Fair to Poor

Cultural Affiliation: Euroamerican

Summary: Individual 9b was possibly a secondary burial that had been moved and buried with 9a. Individual 9b bones were clearly discernable from 9a based on size, weathering, and coloration.

There was significant bioturbation in this burial, and 9b bones were clearly displaced, and scattered throughout the burial.

Tooth development suggests an age of at death of birth ± 2 months (Ubelaker 1979). No Moorrees value was possible. The progress of bone union is indicative of fetal age. The mandibular symphysis is open, as is the metopic suture of the frontal bone. It is unclear if the tympanic rings of the temporals were in union with squama, but the petrous portions are definitely not. The morphology of the petrous portions is indicative of late fetal age. The greater wings of sphenoid are open. We cannot tell if the lesser wings were in union as they are missing. Measurement of left femur length suggests an age of -.46 year +/- 1.53 years (Primeau et al. 2016) which is consistent with a mid to late fetal age, although the standard error is large. Taken as a whole, these indicators suggest a mid to late fetal age of death.

Individual 10:

Context: Individual 10 came from Burial 10.

Skeletal Inventory: Most of the cranial bones are absent, except for petrous portions of temporals; both scapulae; fragments of five cervical, 11 thoracic, four lumbar vertebrae; portions of 10-11 ribs (both sides) including 1st and 2nd, portions of the humeri, femora, tibia, plus metacarpal and phalanges fragments.

Age: infant

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is very poor with significant weathering (Stage 3 to Stage 5) and many missing bones. Several unidentifiable tooth shards are present. Six indeterminate vertebral centra and six indeterminate neural arches are present.

Permanent and deciduous dentition were present, but in very poor condition. Tooth development suggests an age at death of 1 year ± 3 months (Ubelaker 1979). No Moorrees estimate was possible.

No long bone length measurements were possible. Based on the morphology and size comparison (Baker et al. 2005) of the femoral proximal ends, age at death of the individual is estimated at 12 to 18 months. No estimates of age based on bone union were possible due to poor preservation. Overall, the best estimate for the age of death of this individual is approximately 1 year.

Individual 11:

Context: Individual 11 came from Burial 11.

Skeletal Inventory: Most of the crania including frontals, parietals, occipital, right temporal, sphenoid, zygomatic, left maxilla and mandible. Postcranial remains include left clavicle both scapula both innominates sacrum, portions of cervical vertebrae C1 and C2, eight thoracic vertebrae, three lumbar vertebra, and 10 ribs. Portions of all upper and lower limbs were also recorded, but no definitive carpals, tarsals, or phalanges.

Age: Infant

Sex: N/A

Pathology: Possible

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor with significant weathering (Stage 3 to Stage 5) and many missing bones.

Permanent and deciduous dentition were present, but in very poor condition. Tooth development suggests an age at death of 1 year ± 4 months (Ubelaker 1979). No Moorrees estimate was possible.

No long bone length measurements were possible. Estimate of age based on bone union (e.g. temporal squama and petrous union nearly obliterated but mandibular symphysis open) indicates a possible Perinate. Overall, the best estimate for the age of death of this individual is approximately one year.

Right temporal pathology is characterized by a possible large lytic lesion adjacent and slightly above the superior semi-circular canal with radiating lytic porosity over the expanded mastoid region. However, we believe the damage may be an artifact of weathering and are leaving this as a possible pathology. See Jardine (2006:55) for comparative photo.

Individual 12:

Context: Individual 12 came from Burial 12.

Skeletal Inventory: Most of the crania including frontals, parietals, occipital, temporals, sphenoid, left maxilla. Postcranial remains include left scapula both innominates sacrum, portions of one cervical vertebra and nine thoracic vertebrae, and five ribs fragments. Portions of the right humerus and left femur are also represented.

Age: Infant

Sex: N/A

Pathology: Lytic lesions of the temporals

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor with significant weathering (Stage 3 to Stage 5) and many missing bones. Most cranial elements are present, but no teeth. Dark discoloration is present on some bones.

Without teeth it was not possible to use dental development comparison with Ubelaker or a Moorrees estimate for age.

All of the cranial sutures are recorded as open. The petrous and temporal squama portions of the temporals are fused. The lesser wings of the sphenoid are fused to the body. Measurement of the right humerus indicates a fetal age (Primeau et al. 2016). Overall, the best estimate for the age of death of this individual is approximately birth to 1 year.

Right temporal pathology is characterized by a several lytic lesions near the union of the mastoid region and temporal squama.

Individual 13:

Context: Individual 13 came from Burial 13.

Skeletal Inventory: Fragments of right petrous portion of the temporal, right humerus, left radius, both femora. No teeth

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor with significant weathering (Stage 4 to Stage 5) and few bones. No cranial elements are present, except for one pars petrosa of the temporal.

Without teeth it was not possible to use dental development comparison with Ubelaker or a Moorrees estimate for age.

Age at death estimate is based on the morphology of the petrous portion of the temporal, which indicates late fetal life (Schaefer et al. 2009; Scheuer and Black 2004).

Individual 14:

Context: Individual 14 came from Burial 14.

Skeletal Inventory: Cranium except for right parietal; clavicles, scapulae, sacrum, seven cervical, eleven thoracic, and five lumbar vertebrae; nearly all ribs, including both 1st and 2nd from both sides; both humeri.

Age: Infant

Sex: N/A

Pathology: cribra orbitalia

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor with significant weathering (Stage 4 to Stage 5) and loss of most of lower skeleton.

Permanent and deciduous dentition are present. Tooth development data suggest an age at death of 6 months ± 3 months (Ubelaker 1979). No Moorrees estimate was possible.

Bone union supports the dental age. Neural arches of the thoracic vertebrae are in union, but other vertebral arches are open. The petrous portions of the temporals are in union with squama. The mandibular symphysis is in union. No measurement of long bones was possible. Evidence indicates age of death was during the first year of life.

Individual 15:

Context: Individual 15 came from Burial 15.

Skeletal Inventory: Cranium; clavicles, scapulae, sacrum, 7 cervical, 12 thoracic, and 5 lumbar vertebrae; nearly all ribs, including both 1st and 2nd from both sides; upper limbs, lower limbs except for fibula, carpals metacarpals and phalanges from both hands. No foot bones.

Age: Infant

Sex: N/A

Pathology: Bone loss

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor: with relatively minor weathering (Stage 2 to Stage 4) of the bones recovered, but loss of most of lower skeleton.

Tooth development data suggests an age at death of birth ± 2 months (Ubelaker 1979). A Moorrees estimate of the 1st molar indicates an age of 2-3 months.

Bone union supports the dental age. The frontals are open as is the mandibular symphysis. The petrous and squama portions of the temporals were in union. The greater wings and completed sphenoid body are in union. Combined evidence indicates age of death was during the first year of life.

Lesions on both zygomatic bones are discernable. Possible bone loss on alveolar and palatine processes of the maxilla, but conservatively we have not recorded it as pathology.

Individual 16:

Context: Individual 16 came from Burial 16.

Skeletal Inventory: Cranium missing except for temporal fragments; right radius and ulna; right femur, right tibia.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation is poor with significant weathering (Stage 1 to Stage 5).

Lack of teeth makes Ubelaker or Moorrees age estimate impossible.

Comparison of ulnar and radial size within Baker indicates third trimester fetal age. Evidence indicates age of death was during the late fetal stage of development.

<u>Individual 20:</u>

Context: Individual 20 came from Burial 20.

Skeletal Inventory: Virtually complete. Cranium, mandible; seven cervical, 12 thoracic, five lumbar vertebrae; sacrum. Os coxae (minus pubic bones). Ribs include 1^{st} and 2^{nd} (both sides), plus 10 left and nine right; all limb bones, carpals, metacarpals and hand phalanges (unsided); left and right tarsals, metatarsals, and phalanges. Hyoid also present. All permanent teeth except for left M_1.

Age: Young Adult

Sex: Male

Pathology: Cribra orbitalia (healed); enamel defects, spinal pathologies

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation is fair to good with significant weathering on some bones (Stage 2-5). Adherent material (cloth, coffin wood) on multiple bones. Hair still preserved on cranium.

Based on dentition, estimated dental age is over 21 years (Ubelaker 1979).

Suture closure of the cranium reveals an unusual variation: the entire sagittal suture is completely obliterated, while the lambdoidal and coronal sutures are completely open. Overall, the suture closure scores for the vault suggest an average age of approximately 35, with a range of 23-45 years. The lateral anterior suture score average is 32 years, with a range of 30-44.

The auricular surface of the ilium suggests an age of 30-34. In addition, the epiphyseal lines are not fully obliterated on the radii and ulnae (bilaterally), nor on the femoral heads (bilateral). The left clavicular epiphyses are partially fused, but unfused on the right. These data suggest the individual's age of death was likely between 25-35 years.

After assessing these multiple lines of evidence, the data indicate a likely age of death between 30 and 35 years.

Sex was determined by a combination of factors. The morphology of pelvis and skull each provided scores of 5 on the *Standards* scale. The pubic symphyses are missing so were not used. Talus length measurement, femoral and humeral head measurements were all in the male range.

Individual 20 displays healed cribra orbitalia in both orbits. In addition, resorption of the alveolar process along the entire length of the maxilla is noted, with associated bone thinning resulting in visible tooth roots. Enamel perikymata (minute transverse ridges on the surface of the tooth) are noted on the 1st upper right molar (significant), both lateral incisors (slight), and left central incisor. Perikymata are also noted on all 4 mandibular incisors. Caries on both upper and lower molars and premolars have been filled with what may be gutta-percha.

There is also spinal damage indicative of heavy stress loads. Schmorl's nodes are noted on thoracic vertebrae T2 through T12 and all lumbar vertebrae. Two lumbar vertebrae also show arthritic lipping. There is also an expanded rib facet on one thoracic vertebra. These traits combined suggest significant repetitive stress on a relatively young individual.

The individual is moderately tall and robust. Based on a combination of long bone length measurements, estimates of stature range from approximately 5'6" ± 1" to 5'11" ± 4" (Trotter 1970; White et al. 2012). Four of the six measured bones estimate indicate the individual was approximately 5' 7" tall. Long bones are robust, suggesting significant physical activity during the individual's life (Stock and Shaw 2007).

<u>Individual 21:</u>

Context: Individual 21 came from Burial 21

Skeletal Inventory: Virtually complete. Cranium; 7 cervical, 12 thoracic, 5 lumbar vertebra; manubrium and 2 sternal bodies, sacrum, os coxae (minus pubic bones). Ribs include 1st and 2nd (both sides), plus 10 left and 10 right. All limb bones, carpals, metacarpals and hand phalanges (unsided); left and right tarsals, metatarsals, and phalanges. All permanent teeth except for M_1 and M_3 as well as both M^1 and M^3

Age: Young Adult

Sex: Female

Pathology: Deformation of the knees.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation is fair to good with significant weathering and root etching on some bones (Stage 2-5). Adherent material (cloth, coffin wood) on multiple bones.

Based on dentition, estimated dental age is over 21 years (Ubelaker 1979). Suture closure of the cranial vault suggest an average age of approximately 30, with a range of 19-44 years. The lateral anterior suture score average is 32 years, with a range of 21-42. Neither the pubic symphyses nor auricular surfaces were present for analysis. After assessing these multiple lines of evidence, the data indicate a likely age of death of approximately 30 years.

Sex was determined by a combination of factors. The morphology of pelvis provided a score of 1 and those of the skull provided a score of 2 on the *Standards* scale. The pubic symphyses are missing so were not used. Femoral midshaft circumference, as well as femoral and humeral head diameters were all in the female range.

The dentition of Individual 21 is unusual (Figure 4). Both of the upper lateral canines appear underdeveloped and abnormally peg-shaped, though they are both fully erupted. All four first molars are missing, and the sockets are remodeled. None of the third molars have fully erupted. The maxillary 3rd molars are observable in their crypts. The mandibular 3rd molars are completely encapsulated and cannot be observed. Caries are exhibited on eight teeth.

We believe there is an issue with the knee joint articulation of both legs. The intercondylar tubercles of each tibia protrude excessively, resulting in problematic articulations with the femora. We believe that in order for this person to have walked normally, the meniscus would have had to have been extremely robust. Much more likely we believe that an excessive angle of articulation in the knee joint probably left this individual with an abnormal gait. The problems of the knee probably lead to arthritis of the sacro-iliac joint (Figure 5) There is blastic activity near the auricular surface of the ilium. In addition, there is sacral osteophytic lipping on the dorsal aspect of the sacral auricular surface. Oddly, there is no clear burnishing, lipping, or other indication of arthritis in the femora, tibia, or patellae.

The individual is not as large or robust as Individual 20. Based on a combination of long bone length measurements, estimates of stature range from approximately 5’0” ± 2” to 5’2” ± 1” (Trotter 1970; White et al. 2012)

Figure 4. Individual 21. Remodeling of alveolar processes and peg-like teeth. Left: mandible, right: maxilla.

Figure 5. Individual 21. Right-sacral-iliac-joint-arthritis.

<u>Individual 23:</u>

Context:	Individual 23 came from Burial 23.
Skeletal Inventory:	Left parietal, frontal (left and right), both temporals (pars petrous).
Age:	Fetal
Sex:	N/A
Pathology:	None noted
Taphonomy:	Poor
Cultural Affiliation:	Euroamerican

Summary:

No teeth are present. Frontal bones are not in union. No postcranial elements identifiable. Morphology of the petrous portion indicates that the individual was of late fetal age to perinatal at time of death.

<u>Individual 24:</u>

Context: Individual 24 came from Burial 24.

Skeletal Inventory: Frontal (left and right), both temporals (pars petrous), occipital (basilarus only), sphenoid, right zygomatic, both maxillae, mandible. Two indeterminate, badly weathered long bone fragments.

Age: Infant-Perinate

Sex: N/A

Pathology: Cranial lytic lesions

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation very poor. Many missing bones and presence of white mold.

No teeth are present. No postcranial elements identifiable.

Frontal bones are not in union. Morphology of the petrous portion of the temporals indicates that the individual was of late fetal age to perinatal at time of death. Mandibular symphysis is open.

These data suggest that the age of death was shortly before or after birth.

Frontal bone pathology is characterized by numerous lytic lesions on the ectocranial and endocranial surfaces, some with sclerotic build-up. Starburst-like blastic striations are also noted on the endocranial surface.

It is also possible that the maxillae exhibit porosity and thinning on the palatine process.

Individual 25:

Context: Individual 25 came from Burial 25.

Skeletal Inventory: Frontal (left and right), both temporals (pars petrous), occipital (basilarus only), sphenoid, both zygomatic, right maxilla, mandible (right and left), clavicles, scapulae, ilia, 6 cervical, 9 thoracic, 4 lumbar vertebra. Manubrium and two sternal bodies. Left 1st rib, 7 left and 6 right rib fragments. Both humeri, right radius right ulna, both femora, both tibiae. Two unsided carpal phalanges. Two incuses, one malleus, one stapes present.

Age: Infant-Perinate

Sex: N/A

Pathology: Possible blunt trauma, lytic lesions

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (stages 3-5).

Ubelaker indicates an age of 9 months ± 3 months. A Moorrees value of the mandibular molars indicates an age of birth to 5 months.

Morphology of the petrous portion of the temporals indicates that the individual was at least late fetal age to perinatal at time of death. Mandibular symphysis is open, as are all epiphyses listed on the *Standards*. Taken as a whole, these data suggest that the age of death was approximately 5-6 months.

There is clear a dislocation of the cortical bone potentially caused by blunt trauma; however, there is also evidence of pathological sclerosis associated with the lesion (Figure 6).

Figure 6. Individual 25. Left frontal showing possible blunt force trauma.

<u>Individual 26:</u>

Context: Individual 26 came from Burial 26.

Skeletal Inventory: Both temporals (pars petrosa).

Age: Fetal-neonate

Sex: N/A

Pathology: none noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is extremely Poor (Stage 5). Only the petrous portions of the temporals remain.

The morphology of the pars petrosa suggests this individual was in the late stage of fetal development at the time of death.

Nothing else can be observed from this individual.

<u>Individual 28:</u>

Context: Individual 28 came from Burial 28.

Skeletal Inventory: Most of cranium except for maxilla. Both clavicles, both scapulae, os coxae, 7 cervical, 12 thoracic, and five lumbar vertebra, 8 left and 6 right ribs, all limb bones, right and left talus and calcaneus, most hand and foot bones. Hyoid is also present.

Age: Middle Adult

Sex: Male

Pathology: Deformed lower limbs.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stage 3-4).

Based on dentition, estimated dental age is over 21 years (Ubelaker 1979). Suture closure of the cranial vault suggest an average age of approximately 45, with a range of 31-65 years. The lateral anterior suture score could not be taken as the maxillae are missing. Suchey-Brooks method of dating based on os coxae provided an estimate of 38 years with a range of 26-60+, and the auricular surfaces of the ilia suggest an age range of 40-44. The pubic symphyses were not present for analysis. After assessing these multiple lines of evidence, the data indicate a likely age of death of approximately 40-45 years.

Sex was determined by a combination of factors. The morphology of pelvis and skull each provided scores of 5 on the *Standards* scale, although it should be noted that portions of the right side of the skull were missing due to weathering. Left talus length measurement, along with right femoral head diameter and mid-shaft circumference measurements were all in the male range.

The individual displayed several pathological conditions. The left tibia and fibula appear to be bowed. Both right and left innominates display lipping of the acetabulum, which is indicative of arthritis.

Both humeral heads are flattened and do not appear to have articulated normally with the glenoid fossa, although there is no burnishing or active arthritis presented in the shoulder area. However, arthritis is present in the elbow, with burnishing and striations showing on the right ulna. The proximal epiphysis of the ulna also shows bone loss as does the distal epiphysis of the right humerus. In addition, the lateral portion of the right clavicle is extremely robust.

The individual had numerous caries in eight of the maxillary and mandibular premolars and molars that were recovered. The 1st right premolar is deformed.

Stature measurements from eight long bones indicate a range of 5’6” ± 2” to 5’8” ± 1”.

Finally, the fact that the entire skull is present, except for the maxillae--but with the presence of maxillary dentition--is something for which we have no good explanation.

Individual 29:

Context: Individual 29 came from Burial 29.

Skeletal Inventory: Most of cranium except for maxilla. Both clavicles, both scapulae, os coxae, 7 cervical, 12 thoracic, and five lumbar vertebrae, 2 sacral vertebra. Manubrium, 11 left and 10 right ribs including the 1st and 2nd ribs on both sides. Left femur, right and left humeri, radii, ulna, and tibia. Metacarpals and phalanges from both hands.

Age: Infant-Perinate

Sex: N/A

Pathology: Deformed lower limbs.

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stage 2-4).

Based on dentition, estimated age at death is 6 months ± 3 months (Ubelaker 1979). No Moorrees value could be taken. Bone union data support the dental age. The mandibular symphysis was in union, but not fused. The metopic suture was open, the greater wings of the sphenoid and sphenoid body were not in union nor was the sphenoid body in union with the presphenoid. However, the foramen ovale on the greater wings is closed. Petrous portions of the temporal are in union with the squama. One lower thoracic vertebral neural arch was fused; all others were unfused. Based on long bone measurements (Primeau et al. 2016) the estimated age is between 1.5 and 3.0 months. Taken as a whole, these data suggest a probable age at death of 3 to 6 months.

The individual displayed several pathological conditions. The left femur and tibia appear to be bowed. The cause of the deformation is unknown, but does not appear to be due to post-depositional stresses (Figure 7).

The cranium shows porotic hyperostosis affecting the frontal, occipital squama and parietals. However there are lytic lesions both endocranially- and ectocranially, so it is possible that some other pathology is co-occurring with what we perceive as porotic hyperostosis.

Figure 7. Individual 29. Top: Left femur, posterior view. Note anterior rotation of proximal portion. Bottom: Left tibia, posterior view. Note rotation of diaphysis.

<u>Individual 30:</u>

Context: Individual 30 came from Burial 30.

Skeletal Inventory: Most of cranium except for right temporal. Mandible, both clavicles, both scapulae, both innominates, 7 cervical, 11 thoracic, and five lumbar vertebrae, sacrum. Manubrium, and sternal body, 8 left and 7 right ribs including the 1st and 2nd ribs on both sides. All upper and lower limbs. Right and left talus and calcaneus, indeterminate tarsals, metatarsals, and phalanges from both feet. Indeterminate metacarpals and phalanges from both hands. Hyoid body and horns are present. Permanent 1st and 2nd molars and permanent incisors.

Age: child

Sex: N/A

Pathology: Deformed lower limbs.

Taphonomy: Fair to good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stage 2-5).

Based on dentition, estimated age at death is 9 years ± 24 month (Ubelaker 1979), but the dentition is unusual. No Moorrees value could be taken. There is a fragmented loose permanent third molar. There are empty sockets for the permanent 3rd molar on both sides of the maxilla, and the left side of the mandible. The mandible is remodeled where the left second deciduous molar should be.

Bone union data support the dental age. Cranium is articulated, metopic suture is obliterated but other sutures are open. All vertebral neural arches are in union with centra, and the ischium-pubis is in partial union. No long bone epiphyses are in union. Combined length of clavicles =96 mm. These data support an age of 5-10 years old.

The individual displayed a temporal pathology characterized by endocranial lytic lesions over the mastoid and adjacent region. Ectocranially, there is potential bone loss below the middle meningeal groove below the petrous portion.

Individual 31:

Context: Individual 31 came from Burial 31.

Skeletal Inventory: Cranium complete. Mandible, both clavicles, both scapulae, both innominates, 7 cervical, 10 thoracic, and 5 lumbar vertebrae, sacrum. Manubrium, and sternal bodies, 8 left and 9 right ribs including the 1st and 2nd ribs on both sides. All upper and lower limbs. Right and left talus and calcaneus, indeterminate tarsals and metatarsals. Permanent 1st and 2nd molars and permanent incisors.

Age: child

Sex: N/A

Pathology: Possible

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stage 2-4).

Based on dentition, estimated age at death is 7 years ± 24 month (Ubelaker 1979). Deciduous first and second mandibular molars have erupted. The first permanent maxillary molars and incisors have not erupted but are just below the alveolar border. Permanent central mandibular incisors have erupted, lateral incisors are just below the alveolar surface. The left maxillary first permanent molar is misaligned and is pushing against the second deciduous molar.

Bone union data support the dental age. Comparisons of long bones with Baker et al. (2005) indicate an age in excess of 5 years. Cranium is articulated, metopic suture is obliterated but other sutures are open. All cervical and thoracic neural arches are in union with centra, lumbar neural arches are in partial union with centra and the ossification centers of the os coxae are open. Occipital lateral and basilar portions are in union. No long bone epiphyses are in union. Based on Primeau et al. 2016, the lengths of both femora and right tibia indicate an approximate age of 7 years ± 16 months.

These data support an age of death of 5-10 years old.

Individual shows some evidence of lytic lesions on the mastoids and adjacent areas of both temporals.

Individual 32:

Context: Individual 32 came from Burial 32.

Skeletal Inventory: Temporals, maxillae, mandible. Right scapula, both tibiae. Fourteen deciduous teeth.

Age: infant

Sex: N/A

Pathology: tooth enamel imperfection

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage 5), many missing bones.

Based on dentition, estimated age at death is 7 years ± 24 month (Ubelaker 1979). A Moorrees value of the right deciduous mandibular molar indicates an age of approximately 8 months.

Bone union data support the dental age. Mandibular symphysis is in union but not fused, suggesting first year of life.

The individual's 2nd maxillary molars displayed several rough and discolored patches of enamel. Amelogenesis imperfecta is a possibility.

Individual 33a:

Context: Individual 33a came from Burial 33. Commingled with 33b. A headstone engraved with "Franciszka Bautch 1873 10 May 1902" was associated with this burial by the excavation crew.

Skeletal Inventory: Complete cranium and mandible. Complete infracranial skeleton with the exception of some ribs, hand and foot bones.

Age: Young Adult

Sex: Female

Pathology: Occipital bone loss, twisted femora

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stage 2-4), with adherent coffin wood, green staining of the hand bones, and root etching on the cranium.

The headstone that the excavation crew judged associated with this burial would place the age of death at 29. Based on dentition, estimated age cannot be made as all teeth are gone and alveolar processes have remodeled. The complete loss of teeth was likely done intentionally in order to fit the individual for dentures, which were found with the burial. Bone union data support an age consistent with the headstone. All epiphyses are closed. Cranial suture closure value for the vault=10, indicating a mean age of 39.4 with a range of 24-60. Suchey Brooks score=3, suggesting an approximate mean age of 33, range of 21-52. The iliac auricular surface of scores of 4 for the left and 3 for the right suggest an age range of 30-39. The average age on our skeletal measures are slightly above the age derived from the headstone, but are easily within the range of variation. If that headstone is correctly associated with this individual, age at death can be confidently stated to be 29.

Cranial and Pelvis scores for Sex were each 1 to 1.5, indicating a female. Right and left femoral head diameters are in the range for female (36 and 37 mm). Femoral midshaft circumference was also used as a measure of sex. The right femoral value of 72mm is female, the left femoral value of 85 is male. However, we the right femoral diaphysis is pathologically thickened. Talus length values of 46 mm are in the range of female (Gualdi-Russo, Emanuela 2007; Holland 1995; Steele 1976).

The left femur is much shorter (363mm vs. 376mm) and thicker (85mm vs. 72mm midshaft circumference) than the right femur. The left femur displays sclerotic enlargement of the linea aspera and adjacent bone, and is significantly heavier than the right (197g vs. 179g) (Figure 8). Right and left femoral head diameters are essentially the same size and help confirm that the thickening of the diaphysis is abnormal.

This individual also displays a hole in her occipital squama. The bone immediately surrounding the hole is thinned. We deem the hole to be the result of pathological cortical thinning that was punched through either by a root or general attrition.

Estimating stature for this individual is interesting and complicated. Based on upper limb bones and her tibia, her stature is between 4’11” and 5’0” (Trotter 1970). Her left femur indicates a height of 4’7” and

her right femur indicates a height of 4'9." Given the pathological condition of her femora her exact height is probably unknowable, but it was likely between 4'7 to 5' 0" in height.

Figure 8. Individual 33a. Left femur showing thickened diaphysis and blastic lesions, posterior.

Individual 33b:

Context: Individual 33b came from Burial 33. Commingled with 33a. Found between the femora of 33a.

Skeletal Inventory: All major bones of the cranium and mandible. A total of 16 deciduous teeth. Both clavicles, right scapula, both ilia, right ischium. All cervical vertebrae, 11 thoracic vertebrae, five left and seven right ribs, right humerus and ulna, right femur, left tibia. Four metacarpals and 24 unsided phalanges.

Age: infant-Perinate

Sex: unknown

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage 2-5), particularly the upper and lower limbs, most of which are missing or heavily fragmented.

Based on dentition, estimated age at death is 6 months ± 3 months (Ubelaker 1979). A Moorrees values from a mandibular canine and 1st mandibular molar indicates an approximate age of 2 months.

Bone development data support a infant-perinatal assignment. The mandibular symphysis is in union but not fused. The petrous portions of the temporals are in union with squama. Frontal bones are separate. The greater wings of the sphenoid are open, but the lesser wings are in full union. Assessment of right femur length (74mm) also suggests a perinatal age (Primeau et al. (2016). Finally a measurement of the length of the occipital pars basilarus indicates an age of 38 fetal weeks, while the maximum width of the

basilarus indicates a perinatal age. Taken as a whole, an age at death of approximately 2-3 months is supported.

Individual 34:

Context: Individual 34 came from Burial 34.

Skeletal Inventory: Frontals, parietals occipital base, sphenoid greater wings zygomatic, maxillae, two malleus, one incus, mandible. Clavicles, scapulae. Six cervical (dens present on axis), 11 thoracic, five lumbar vertebrae; sacrum. Five left and three right ribs. Right humerus, left radius, both ulnae, both femora, both tibiae. Left metacarpals and phalanges. Fourteen deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: possible

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5), many fragmented bones, missing limbs.

Based on dentition, estimated age at death birth ± 2 month (Ubelaker 1979). A Moorrees value of a deciduous mandibular canine indicates an age of approximately 2 months.

Bone union data support the dental age. The temporal squama petrous portions are in union, the metopic suture of the frontals is open, the mandibular symphysis is open, and the greater wings of the sphenoid are not in union with the body.

As a whole, the evidence suggests that age of death was approximately two months.

Individual 35:

Context: Individual 35 came from Burial 35.

Skeletal Inventory: Frontals, sphenoid, both zygomatics and maxillae, mandible. Left scapula fragment, six cervical (dens present on axis) and five indeterminate vertebral neural transverse fragments. 1st left rib and 3 left rib fragments, right humerus, left femur. Twenty deciduous teeth.

Age: Infant

Sex: N/A

Pathology: none noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 3-5), cranial bones fragmented, many missing limbs.

Based on dentition, estimated age at death 6 months ± 2 month (Ubelaker 1979). A Moorrees value of 1st and 2nd mandibular molars indicates an age of approximately 6-7 months.

Bone union data support the dental age. The left temporal squama and petrous portions are in union, the mandibular symphysis is open, and the greater wings of the sphenoid are not in union with the body.

As a whole, the evidence suggests that age of death was approximately 6-9 months.

<u>Individual 36:</u>

Context: Individual 36 came from Burial 36.

Skeletal Inventory: Complete cranium and mandible. Left clavicle, both scapulae. Seven cervical, 12 thoracic, and five lumbar vertebrae. Os coxae and sacrum (including two coccygeal vertebrae). Left and right 1st and 2nd ribs, 10 left and nine right ribs. All limbs, right and left talus, right and left calcaneus. Carpals, tarsals and phalanges from both sides. Twenty deciduous teeth. The 1st and 2nd permanent molars are present, but not in occlusion.

Age: Infant

Sex: N/A

Pathology: Lesions

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 1-3). Some discoloration due to coffin wood and cloth.

Based on dentition, estimated age at death 4 years ± 12 month (Ubelaker 1979). No Moorrees value could be taken. All for permanent 1st molars and both mandibular 2nd molars were present, but not in occlusion, indicating the individual was probably not quite 6 years old.

Bone union and development data support the dental age. Mandibular symphysis is in union. Neural arches are in partial union on cervical, thoracic and lumbar vertebrae, but not in union with their centra—consistent with an age of circa 4 years old. Long bone length estimates from Pireau et al. (2016) provide a range from 3.9 to 7.9, but averages suggest 5.5 years. A comparison with illustrations in Baker et al.

(2005) suggests an age of at greater than 5. As a whole, the evidence suggests that age of death was between 5-6 years.

The individual's orbits show well defined, but not sclerotic lesions. Bones affected include the left frontal, zygomatic, and lacrimals, as well as left and right ethmoids. In addition there is a lesion on the proximal diaphysis of the right humerus.

<u>Individual 37:</u>

Context: Individual 37 came from Burial 37.

Skeletal Inventory: Left parietal, both temporal bones, indeterminate fragments. Six deciduous teeth, fragmented. One indeterminate long bone fragment is present.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage 5).

Based on dentition, estimated age at death birth ± 2 month (Ubelaker 1979).

The morphology of the temporal petrous portions supports the early range of the dental age, at 7 months in utero. The best estimate of age of death is late fetal.

<u>Individual 38:</u>

Context: Individual 38 came from Burial 38.

Skeletal Inventory: Right parietal, left frontal, both temporal bones, sphenoid greater and lesser wing fragments, indeterminate fragments. Six deciduous teeth, fragmented. Left radius and ulna fragments, both femur and tibia fragments, indeterminate long bone fragments.

Age: infant

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage 5).

Based on dentition, estimated age at 9 months ± 3 month (Ubelaker 1979).

The petrous portions of the temporals are fused to the squama, but the lack of meningeal canals on the parietal fragment suggests that the earlier range of dental age estimation is supported. The best estimate for age at death is approximately 6 months.

Individual 39:

Context: Individual 39 came from Burial 39. It appears to have been burned.

Skeletal Inventory: Most of the cranium, minus parietals and left zygomatic. Hyoid body and horns are present. Both clavicles, right scapula, manubrium, two sternal bodies, 1st left and right ribs, nine left and seven right ribs. Six cervical, 11 thoracic, five lumbar vertebrae, sacrum, os coxae. Right humerus, radius and ulna, left humerus, indeterminate fragments. All lower limbs or limb fragments. Right carpals, metacarpals and phalanges a singe left metatarsal. Eighteen deciduous teeth, permanent central incisors, permanent 1st and 2nd molars are present in both mandibles and maxilla, but not in occlusion.

Age: child

Sex: N/A

Pathology: healed porotic hyperostosis

Taphonomy: Fair to Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair to Poor (Stages 2-5). Burning is a major factor in bone recovery and identification.

Based on dentition, estimated age at is 6 years ± 24 months (Ubelaker 1979). Bone fusion supports the dental age. The mandibular symphysis is in union, and the petrous portions of the temporals are in union with squama. Frontals, maxillae, sphenoid, and zygomatics are all in union. The hyoid body and greater horns are unfused. Comparison of long bone length with Baker et al. (2005) indicates an age greater than 5. Estimate of age based on Primeau et al. (2016) is approximately 7 years with a range of 5 years to 8.5 years. The best estimate of the age of death is between 6 and 7 years.

The individual has been burned; the lower and left portions of the body have been particularly affected (see forms for details). Burned fabric and wood has adhered to many bones, interfering with identification and analysis. Many indeterminate fragments are smoke and/or calcined, and are likely rib fragments and fragments of hand bones.

It appears that the fire occurred after interment. Excavator's notes indicate burned wood, fabric and soil associated with the burial. At this point, the cause of the fire is undetermined.

Healed porotic hyperostosis is noted for the right frontal bone, but it is barely discernable. Multiple caries are recorded for deciduous maxillary incisors and canines as well as mandibular molars. Abscess noted at left mandibular molars.

Individual 40:

Context: Individual 40 came from Burial 40.

Skeletal Inventory: Most of the cranium, except for zygomatics. Both clavicles, and scapulae, 1st and 2nd left and right ribs, 8 left and 10 right ribs. Seven cervical, 12 thoracic, five lumbar vertebrae, sacrum, os coxae (minus pubis). All limbs or limb fragments. Left and right carpals, metacarpals and phalanges. Left and right metatarsals. Twenty deciduous teeth, first permanent molars present inside alveolar processes.

Age: infant

Sex: N/A

Pathology: Lytic lesions on temporal, possible occipital.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 3-5).

Based on dentition, estimated age at 18 months ± 6 month (Ubelaker 1979).

Bone fusion data support the dental data. The neural arches of the thoracic vertebrae are in union to each other but not the centra. Cervical and lumber neural arches are in partial union. The bones of the skull are articulated, but all sutures are open. The mandibular symphysis is in union. Petrous portions of the temporal are in union with squama. These measures are consistent with individuals during their second year of life. Comparison of bone length to illustrations in Baker et al. (2005) suggests that the individual is slightly older than 1.5 years. Measurements of long bone lengths, based on Primeau et al. (2016) suggest an average age of approximately 2 years with of range of 1.6 years to 4 years. Taken as a whole, the best estimate for age of death is approximately 2 years.

This individual shows several possible pathologies. The occipital has areas of bone erosion and discoloration, although we are not convinced it is not related to water damage (i.e., taphonomy) (Figure 9). The right temporal shows lytic lesions (Figure 10). Finally the orbits show pitting that compares favorably to cribra orbitalia.

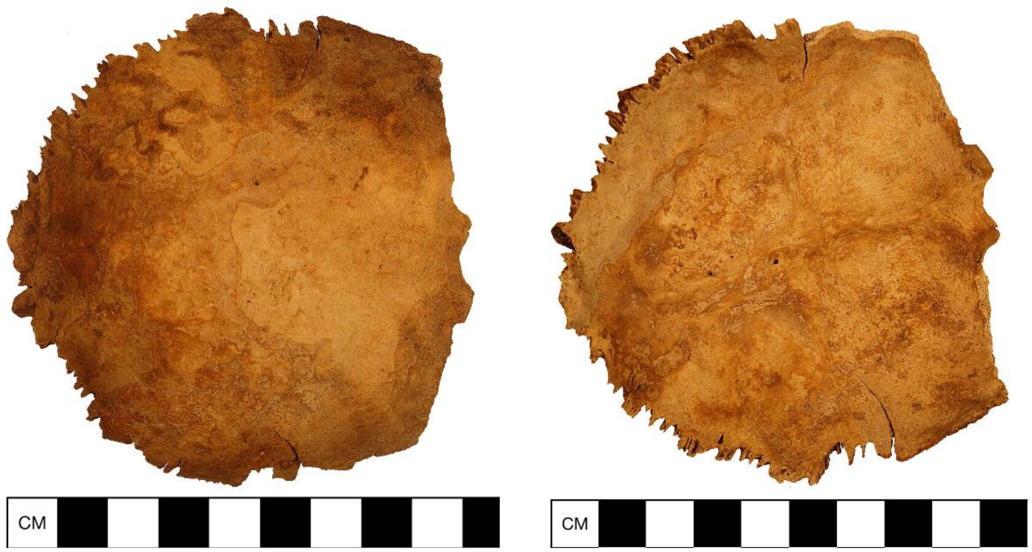

Figure 9. Individual 40. Occipital showing bone loss. Left=ectocranial, right=endocranial views.

Figure 10.   Individual 41. Temporal showing lytic lesions and bone loss.

Individual 41:

Context: Individual 41 came from Burial 41.

Skeletal Inventory: Most of the cranium, except for partial squama of occipital. Both clavicles, and scapulae, 1st and 2nd left and right ribs, nine left and eight right ribs.   Six cervical, 12 thoracic, five lumbar vertebrae, sacrum, both ilia. Manubrium and two sternal bodies. Left and right humeri, right radius, left and right ulnae. Left and right femora, left and right tibiae, right fibula, right calcaneus. Left

and right carpals, metacarpals and phalanges. Left metatarsals. Twenty deciduous teeth, all but upper incisors are in occlusion; second permanent molars present inside alveolar processes.

Age:	infant
Sex:	N/A
Pathology:	Yes
Taphonomy:	Fair
Cultural Affiliation:	Euroamerican

Summary:

Preservation of the individual is fair (Stages 1-5).

Based on dentition, estimated age at 18 months ± 6 month (Ubelaker 1979). No Moorrees values could be taken.

Bone fusion data support the dental data. The neural arches of the thoracic and lumber vertebrae are in partial union to each other but not the centra. Cervical neural arches are in complete union. The bones of the skull are articulated, but all sutures are open. The mandibular symphysis is in union, and almost obliterated. Petrous portions of the temporal are in union with squama. The sphenoid is in union with the right frontal. These measures are consistent with individuals during their second year of life. A comparison of bone length to Baker et al. (2005) illustrations suggest that the individual is approximately 1.5 years of age or greater. Measurement of humerus length, based on Primeau et al. (2016) suggests an age of approximately 2 years with of range of 1.34 years.

Taken as a whole, the best estimate for age of death is approximately two years.

The individual shows bone loss on both frontal bones. There are remodeled lytic lesions on the expanded portions of the mastoid region on both temporals (Figure 11).

Figure 11. Individual 41. Temporal showing lytic lesions and bone loss.

<u>Individual 42a:</u>

Context: Individual 42a came from Burial 42.

Skeletal Inventory: Most of the cranium, except for right zygomatic. Right clavicle, both scapulae, 1st and 2nd left and right ribs, one left and six right ribs. Seven cervical, 11 thoracic, two lumbar vertebrae, sacrum, both ilia and right ischium. Left and right humeri, right radius, left and right ulnae. Left and right femora, left and right tibiae. Unsided carpals, metacarpals and phalanges. Twenty deciduous teeth; permanent teeth present inside alveolar processes.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5).

Based on dentition, estimated age at 4 years ± 12 month (Ubelaker 1979). No Moorrees values could be taken.

Bone fusion data support the dental data. The neural arches of the thoracic and lumber vertebrae are in partial union to each other but not to the centra. Cervical neural arches are in complete union. The bones of the skull are articulated, but all sutures are open. The mandibular symphysis is in union, and almost obliterated. Petrous portions of the temporal are in union with squama. The sphenoid is in union with the right frontal. These observations are consistent with individuals during their second year of life. A comparison of bone length to illustrations in Baker et al. (2005) suggests that the individual is approximately 1.5 years of age or greater. Measurement of humerus length, based on Primeau et al. (2016) suggests an age of approximately 2 years with of range of 1.34 years.

Taken as a whole, the best estimate for age of death is approximately two years.

Individual shows evidence for cribra orbitalia (Figure 12), as well as lytic lesions on both temporals. The alveolar bone on the maxillae and mandible are anteriorly flaked away, exposing some permanent dentition that would otherwise be hidden.

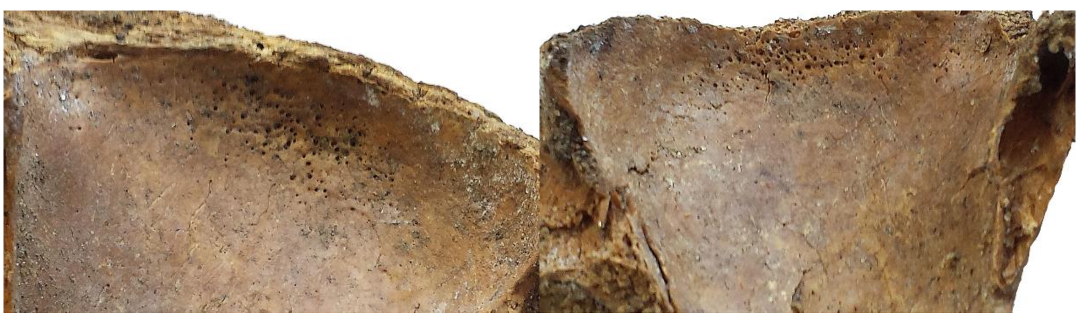

Figure 12. Individual 42a. Left: Cribra orbitalia of left orbit. Right: Cribra orbitalia, left orbit.

<u>Individual 42b:</u>

Context: Individual 42b came from Burial 42.

Skeletal Inventory: All of the cranium and mandible. Both clavicles, both scapulae, 1st and 2nd left and right ribs, nine left and six right ribs. Six cervical, 11 thoracic, five lumbar vertebrae, sacrum, both os coxae. All upper and lower limbs. Unsided carpals, left talus, calcaneus, tarsals, metatarsals and phalanges. Deciduous maxillary and mandibular 1st and 2nd molars, maxillary canines. Permanent teeth maxillary and mandibular 1st and 2nd molars.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 3-5).

Based on dentition, estimated age at death is 9 years ± 24 month (Ubelaker 1979). Moorrees values suggest an age of 8.9-9.3 years.

Bone fusion data support the dental data. The neural arches of the cervical, thoracic and lumber vertebrae are in complete union to each other and partial union with the centra. The bones of the skull are articulated, and the metopic suture is nearly obliterated. The other sutures of the skull are open. The mandibular symphysis is in union and almost obliterated. The petrous portions of the temporal are in union with squama. Measurements of femur and tibial lengths, based on Primeau et al. (2016), suggest an age of 9.5-10 years with of range of 1.39 years. Taken as a whole, the best estimate for age of death is approximately 9 years.

Cribra orbitalia shows in the left orbit more extensively than in the right (Figure 13). The maxillary, sphenoid and perpendicular plates of the palatines show extreme lesions and remodeling, severely damaging the back of both orbits. The right temporal also shows lytic lesions (Figure 14).

Figure 13. Individual 42b. Left: Right orbit showing cribra orbitalia. Right: Left orbit showing erosion and lesions of the back.

Figure 14. Individual 42b. Right temporal bone loss on the mastoid and exterior auditory meatus. Ectocranial view.

Individual 45:

Context: Individual 45 came from Burial 45.

Skeletal Inventory: Both temporals and lesser wings of the sphenoid. Left scapula. Neural arches of first and second cervical and one thoracic vertebrae. Two broken deciduous incisors.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 3-5).

We have no good dental data to estimate age, as the two incisors are too badly damaged to note development. None of the cranial bones appear to have been in union and neither the cervical nor thoracic

vertebral arches are fused. The petrous portions of the temporal bones are not in union with squama, and their morphology indicates a late fetal age. It is most likely that the individual was a fetal perinate at age of death.

Individual 46:

Context: Individual 46 came from Burial 46.

Skeletal Inventory: Both frontals, parietals, temporals, maxillae and zygomatic bones. Left portion of the mandible. Left scapula, both femora, right tibia, and right fibula. All deciduous teeth except for right i_2. Permanent teeth including maxillary and mandibular 1st molars, left I^1 and I_1 are present.

Age: child

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 2-5).

Based on dentition, estimated age at death is 4 years ± 12 month (Ubelaker 1979). No Moorrees value could be taken.

Bone fusion data support the dental data, but it is meager. The metopic suture is in union but is not obliterated. The petrous portion of the right temporal is in union with squama; the status of the left temporal union is indeterminate. Although Ubelaker's range is 3-5 years, altogether the data indicate that the child is no more than 4 years old.

Individual 47:

Context: Individual 47 came from Burial 47.

Skeletal Inventory: Left temporal, right portion of mandible. Left clavicle and scapula. Right humerus. Ten deciduous teeth.

Age: child

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 4-5).

Based on dentition, estimated age at death is 1 year ± 4 months (Ubelaker 1979). No Moorrees value could be taken.

Bone fusion data are insufficient to help in age determination.

Individual 48:

Context: Individual 48 came from Burial 48.

Skeletal Inventory: Cranium and mandible. Both clavicles and scapulae. Both os coxae, sacrum, seven cervical, 12 thoracic, and four lumbar vertebrae. Right 1st rib, four left, seven right ribs, numerous indeterminate ribs. Left and right humerus, right radius, left and right femora, tibiae, and fibulae. Left and unsided carpals, metacarpals and phalanges, left and right tarsals, metatarsals and phalanges. All deciduous teeth and all four first permanent molars are present.

Age: infant

Sex: N/A

Pathology: yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5).

Based on dentition, estimated age at death is 1 year ± 4 months (Ubelaker 1979). No Moorrees value could be taken. All four first permanent molars can be seen in their crypts.

Femoral and tibial length measurements suggest an estimated age of 1.3-1.6 ± 1.3 years. The long bones compare favorably with the size of 1.5 years in Baker et al. (2005). Bone fusion data suggest an age of circa 1 year. The neural arches of the cervical vertebrae are not in union, while the neural arches of the thoracic and lumber vertebrae are in partial union but not in union with their centra. The frontals are in union, but the metopic suture is open. Temporal squama and petrous portions are in union. The greater and lesser wings of the sphenoid are in union with the body. The mandibular symphysis is in union.

Based on all data the best estimate of the age of death for this individual is between 1 and 2 years.

The right temporal shows lytic lesions, but no sclerosis. There are also two small holes on the left parietal: One appears to have been punched through by a root, but the other hole has a potential small lytic lesion near it.

Individual 49:

Context: Individual 49 came from Burial 49.

Skeletal Inventory: Left zygomatic.

Age: Indeterminate/Infant-Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage 5).

Only a handful of badly weathered fragments remain. The zygomatic is the only identified element. There are also likely cranial fragments present, and potentially a small neural transverse fragment. An age estimate of infant-perinate could be made based entirely on the size and shape of the zygomatic bone, but that is a very crude estimate.

Individual 51:

Context: Individual 51 came from Burial 51.

Skeletal Inventory: Both temporals, occipital, right parietal, left zygomatic, left maxilla, left palatine, sphenoid, left portion of mandible. Five cervical vertebral fragments. Left humerus and radius, right ulna. Left femur, indeterminate long bone fragments. Dentition consists of left i^1 and m^1, left m_1, i_1 and i_2.

Age: Fetal

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 3-4).

No long bone measurements are possible. The mandibular symphysis is open, and the petrous portions of the temporal are not in union with squama. It is unclear whether or not the tympanic rings of the temporals were in union. The lesser wings of the sphenoid are in union with the body, but the greater wings are not.

Sagittal length of occipital basilarus = 10.35, suggesting an age of 30-32 fetal weeks; width= 11.31, indicating an age of 32 fetal weeks.

Size comparison of the right femoral fragment to Baker et al. (2005) illustration indicates an age between the second and third prenatal trimester.

The weight of the evidence indicates an age of death of late fetal (perinate).

Pathologically, there are lytic lesions on the palatine process of the maxilla, with possible sclerotic activity (Figure 15). There is lytic activity on the temporal squama near the zygomatic process, both ectocranially and endocranially (Figure 16).

Figure 15. Individual 51. Left-Maxilla Inferior

Figure 16. Individual 51. Left temporal, endocranial.

Individual 52:

Context: Individual 52 came from Burial 52.

Skeletal Inventory: Indeterminate fragments.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is extremely poor (Stage 5).

Only a handful of badly weathered fragments remain. All bone identification is tentative, but based on the overall size and morphology of the bones, we conclude this individual's age at death was fetal.

Individual 55:

Context: Individual 55 came from Burial 55.

Skeletal Inventory: Temporals, indeterminate fragments. Tooth fragments.

Age: Infant Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is extremely poor (Stage 5).

Only a handful of badly weathered fragments remain. Petrous portions of the temporals indicate that the individual was at least late fetal stage. Deciduous maxillary central incisors are broken but suggest this individual is somewhere between birth to 6 months.

Individual 64a:

Context: Individual 64a came from Burial 64.

Skeletal Inventory: Frontals, left palatine. Right radius.

Age: child

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with virtually all bones gone and (Stages 3-4) for the few remaining bones. The right radius provides an estimated age at death of 7.4 years ± 1.49 years (Primeau et al. 2016). Cribra orbitalia is present in the left orbit (Figure 17).

Figure 17. Individual 64a. Left orbit exhibiting cribra orbitalia.

Individual 64b:

Context: Individual 64b came from Burial 64.

Skeletal Inventory: Left temporal, sphenoid, left maxilla, left portion of mandible. Left femur, both tibiae, both fibulae, long bone fragments. Ten deciduous teeth.

Age: child

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with virtually all bones gone and (Stages 4-5) for the few remaining bones.

Based on dentition, estimated age at death is 1years ± 2 month (Ubelaker 1979). A Moorrees value from the right mandibular canine provides an age at death of birth-1 year. The petrous portion of the temporal is fused to squama, which does not conflict with the dental data.

Pathological issues are only noted as possible due to the extreme weathering of the bones recovered. However, it does appear that there is porotic hyperostosis near the squamosal suture on the temporal. There also appears to be a lytic lesion adjacent to the external auditory meatus, and the mandibular fossa appears to show some bone remodeling (Figure 18).

Figure 18. Individual 64b. Left temporal; medial view of possible lesions and remodeling. Extreme weathering makes identification of pathology tentative.

Individual 64c:

Context: Individual 64c came from Burial 64.

Skeletal Inventory: Right temporal, right temporal, right clavicle.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with virtually all bones gone and (Stages 2-5) for the few remaining bones.

The frontal bones appear to not have been in union, and the morphology of the petrous portion of the temporal consistent with mid-fetal life.

Individual 125:

Context: Individual 125 came from Burial 125.

Skeletal Inventory: Most of cranium minus parietals. Left portion of mandible. Left clavicle and scapula, both ilia, 4rib fragments. Left and right humeri, left and right femora, right tibia, long bone and cranial bone fragments. Four deciduous teeth

Age: Fetal

Sex: N/A

Pathology: Possible cribra orbitalia.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with many bones gone and (Stages 3-5) for the remaining bones. Based on dentition, age at death was birth ± 2 months (Ubelaker 1979). Bone fusion data support the dental age. The left temporal squama is in union with the tympanic ring, but is not in union with the petrous portion of the bone—indicating an age at death of 35 fetal weeks to sometime in the first year of life. Primeau et al. (2016) provide estimates of early fetal and birth to 2 months, but with large standard deviations. Fazekas and Kosa (1978) indicate 36-38 fetal weeks. Based on these factors we consider this individual to have been Fetal at time of death.

Keeping in mind Lewis's (2000) cautions on discerning bone loss from fetal and infant bone development, there are lesions on the orbit of the left frontal bone that suggest cribra orbitalia (Figure 19). If the condition were linked to porotic hyperostosis and anemia, the development of the bone and the timing of the location of hemopoiesis in the liver of the fetus to the cranial diploe in the child would make this a very tenuous inference. However, (Walker et al. 2009:115; Wapler et al. 2014) argue that cribra orbitalia is not necessarily linked to iron-deficiency anemia, but is often a result of subperiosteal inflammation and may be associated with scurvy, rickets, trauma, and Vitamin B12 deficiency in pregnant and nursing mothers.

Figure 19. Individual 125. Left orbit with indications of cribra orbitalia.

<u>Individual 126:</u>

Context: Individual 126 came from Burial 126.

Skeletal Inventory: Most of cranium minus occipital. Complete mandible. Both clavicles and scapulae, both ilia, left and right 1st and 2nd ribs, fragments. Left and right humeri, left and right femora, right tibia, long bone and cranial bone fragments. Six cervical (dens present on C2), 12 thoracic, and five lumbar vertebrae, sacrum. Manubrium and sternal body. Left and right 1st and 2nd ribs, five left and six right ribs. All upper limbs, both femora, metacarpals and phalanges. Hyoid, one malleus and one stapes also present. All deciduous teeth minus right i^1 are present. All four permanent first molars are present.

Age: Infant

Sex: N/A

Pathology: yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with many bones gone and (Stages 2-5) for the remaining bones. Based on dentition, age at death was 1 year ± 4 months (Ubelaker 1979). Bone fusion data support the dental age. The frontals are in union, but the metopic suture is open. All sphenoid elements appear to have been in union. The petrous portion of the temporal is in union with squama, and the mandibular symphysis is in union, but open. Unfortunately, the neural transverses of the vertebrae are in small fragments; fusion is not observable. Long bone length based on Primeau et al. (2016) provide estimates of 1.6-1.7 years, but with large standard deviations. Long bones compare favorably to Baker et al. (2005) illustrations of 1.5 years. Based on these factors we consider this individual to have been between one and two years old at time of death.

Significant bone loss is seen on the parietals, frontals, temporals, and zygomatic bones (Figures 20-22).

Figure 20. Individual 126. Bone loss on frontals. Left=ectocranial, right=endocranial.

Figure 21. Individual 126. Parietal bones showing bone loss.

Figure 22. Individual 126. Left parietal endocranial view bones showing bone loss.

Individual 127:

Context: Individual 127 came from Burial 127.

Skeletal Inventory: Most of cranium minus zygomatics, maxillae. No mandible. Both scapulae, both ilia, left and right 1st and 2nd ribs, nine left and right ribs. Left and right humeri, left and right femora, right tibia; long bone and cranial bone fragments. Six cervical (including C1and C2 with dens), 12 thoracic, and five lumbar vertebrae, sacrum. Left and right 1st and 2nd ribs, five left and six right ribs. Right and left femora and tibiae, unsided metacarpals and phalanges. Two broken maxillary deciduous teeth.

Age: Infant

Sex: N/A

Pathology: possible

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with Stages 2-4 recorded for remaining bones. Due to the fragmentary nature of the teeth, a dentally derived age at death is indeterminate. Cranial fusion is tentative due to preservation. However, the occipital squama is intact and the superior median fissure is nearly closed, suggesting 5-11 postnatal months. Both sutura mendosa are closed, which usually occurs within the first year of life (Baker et al. 2005). Based on these data, we conclude an age of death during the first year of life.

Significant bone loss is recorded on occipital and ischial bones (Figure 23). However, due to the developmental stage of bones and weathering, the recording of bone loss is tentative.

Figure 23. Individual 127. Occipital with bone loss. Left = ectocranial, right =endocranial.

Individual 128:

Context: Individual 128 came from Burial 128.

Skeletal Inventory: Left temporal, zygomatic, sphenoid fragment and portion of the mandible. Left scapula, one rib fragment. Left and right humeri, left and right femora, right tibia; long bone and cranial bone fragments. Seven indeterminate neural arch fragments. No teeth.

Age: Fetal

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with many missing bones, and Stages 3-5 scored for remaining bones. The left greater wing of the sphenoid was in union with the body. Primeau et al. (2016) measurement of the tibia provides an age of death estimate of birth to 1 month. Size comparison in Baker et al (2005) indicates an age between fetal third trimester and perinatal age. Given these data, we suggest an age of death as Fetal.

Individual 129:

Context: Individual 129 came from Burial 129.

Skeletal Inventory: Entire cranium and mandible. Left and right scapulae, clavicles, and ilia. Seven cervical, nine thoracic, and five lumbar vertebrae; sacrum. Left and right 2^{nd} ribs, nine left and 10 right ribs. All limbs, left and right metacarpals and carpal phalanges. Ten deciduous teeth.

Age: Infant

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor; most bones are present but bone condition is highly variable (Stages 1-5). Preservation is much better on the cranial and upper postcranial portion of the skeleton.

Based on dentition, the age at death estimate is 9 months ± 3 months (Ubelaker 1979). Primeau et al. (2016) indicates late fetal age, but with a large standard deviation of 1.34 years. Bone fusion and suture closure all are open, indicating first year of life.

Individual 130:

Context: Individual 130 came from Burial 130.

Skeletal Inventory: Both frontals, occipital, both temporals, sphenoid, left maxilla, mandible. Left and right scapulae, left and right ilia. Seven cervical, eight thoracic, three lumbar vertebrae, sacrum. Left and right 1st ribs, five left and six right ribs. Left humerus, both femora, right tibia, unsided carpal phalanges. No teeth.

Age: Fetal

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones plus highly variable taphonomy scores for remaining bone (Stages 1-5).

The lack of teeth precludes age of death based on dental evidence. However, bone development and fusion data can provide a tentative assessment. The post-sphenoid body is present; the pre-sphenoid body is not. It is not clear that these two elements were in union. The lesser and greater wing sets are both present and it does not appear that these elements were in union with the sphenoid body elements. The temporals are represented by only the broken petrous portions and one broken (and separate) tympanic ring; fusion is difficult to assess.

The pars laterali of the occipital are noteworthy. The hypoglossal canal of the right pars lateralis appears fused abnormally, whereas there appears to be an extra foramen next to the canal. Furthermore, the hypoglossal canal should not be fused at the estimated age of fetal to neonatal life. Typically, the hypoglossal canal fuses between 2-4 years of age (Baker et al. 2005).

Individual 131:

Context: Individual 131 came from Burial 131.

Skeletal Inventory: Pars petrosa of the temporal.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is very poor: the individual is represented by a roughly 1cm fragment of each petrous portion of the temporal and those are Stage 5 for preservation. The morphology of the extant petrous fragments suggests a mid-fetal age: the inferior border has an angle but the bone is not elongated enough for a late fetal age assessment (see Schaefer et al.2009:18).No other observations can be made on this individual.

Individual 133:

Context: Individual 133 came from Burial 133, and from Catalogue 8, miscellaneous bone that we determined belonged to Burial 133 based on refits, size, morphology, and color.

Skeletal Inventory: Right frontal, occipital, left temporal, sphenoid, both zygomatics, both maxillae, both palatines, mandible. Right and left clavicles, scapulae, ilia and ischia. Three cervical, 12 thoracic, five lumbar vertebrae; sacrum. Right and left 1st ribs, seven left and seven right ribs. All limbs, four unsided metacarpals, five unsided tarsals, six unsided metatarsals, 10 phalanges. All deciduous teeth except for left maxillary canine.

Age: Infant-Perinate

Sex: N/A

Pathology: yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, but variable (Stages 1-5).

Based on dentition, age at death was 6 months ± 3months (Ubelaker 1979). A Moorrees value on a canine suggests 0.26 years (3 months), while a value from the 1st molar suggests 0.39 years (5 months). All sutures are open on the cranium.

Bone development indicates fetal age at death. Length measurements of the femur, humerus and radius suggest an age of death at 40 fetal weeks (Primeau et al. 2016). Taken as a whole, the age of death of the individual appears to have been very close to birth.

Both the zygomatic bones and the mandible show patterns of bone loss that are well defined, but not sclerotic (Figure 24).

Figure 24. Individual 133. Zygomatic bones with bone loss. Left = right; right =left.

Individual 135:

Context: Individual 135 came from Burial 135.

Skeletal Inventory: Complete cranium, mandible. Right and left clavicles, scapulae, ilia and ischia. Seven cervical, 12 thoracic, five lumbar vertebrae; sacrum. Left 1st ribs, left and right 2nd rib, 11 left and eight right ribs. All limbs except for left fibula, eight unsided metacarpals and 11 unsided carpal phalanges; 10 unsided metatarsals, nine unsided tarsal phalanges. Eight deciduous teeth.

Age: Fetal

Sex: N/A

Pathology: Possible

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, but variable (Stages 1-2).

Based on dentition, age at death was birth ± 2 months (Ubelaker 1979). A Moorrees value on a canine suggests late fetal to birth.

Bone fusion supports the dental results. All sutures are open on the cranium. The tympanic rings of the temporals are in union with squama, the petrous portions are not. The metopic suture between the frontals is open. The mandibular symphysis is open. The lesser wings of the sphenoid are fused to the body, but the greater wings are not. Length measurements of the humerus, radius and ulna indicate a late fetal age (Primeau et al. 2016). Altogether, the evidence suggests an age at death of fetal to birth.

There appears to be bone loss on the frontals and temporals, but this observation is tempered by the confounding effects of fetal bone structure itself and the effects of weathering (Figure 25). However, the large hole in the left frontal has a beveled nature, suggesting some reworking of the bone. In addition, the pars basilarus of the occipital has what appears to be remodeling, but again, we are not entirely confident that the variation exhibited in the bone is truly pathological. We are categorizing these pathologies as only possible.

Figure 25. Individual 135. Left frontal bone, endocranial view.

Individual 137:

Context: Individual 137 came from Burial 137.

Skeletal Inventory: Complete cranium, mandible. Right and left clavicles, scapulae. Right ilium, ischium and pubic. Seven cervical, 12 thoracic, five lumbar vertebrae, sacrum. Left and right 1st ribs and 2nd rib, six left and six right ribs. Manubrium and two sternal bodies. All limbs except for left radius, left femur and left fibula. Six unsided carpals, five unsided metacarpals and 21 unsided carpal phalanges; one unsided tarsal and one unsided metatarsal. All deciduous teeth, the permanent maxillary incisors and first two permanent molars are present.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, but variable (Stages 1-2).

Based on dentition, age at death was 5 years ± 16 months (Ubelaker 1979).

Bone fusion and developmental data support an age over 5 years. Measurements of humerus, radius, femur and tibia lengths provide a range of 5 years to 10 years, but average estimate is approximately 7 years (Primeau et al. 2016). Cervical, thoracic, and lumbar vertebral neural arches are fused completely. Six out of seven cervical vertebrae are fused to their centra, but five thoracic vertebrae were not in union with centra. All lumbar vertebrae are at least in partial union with centra. The midline sulcus of the axis (C2) vertebra is not completely closed. A comparison of long bones with illustrations in Baker et al. (2005) indicate the individual was more than 5 years old at time of death. No epiphyses have fused. Based on these data, we conclude that the individual was between 5 and 10 years old at time of death.

This individual shows significant issues with its dentition, including crowded teeth. The permanent upper incisors are nearly on top of one another close to the position of the deciduous lateral incisors.

Moreover, nine deciduous teeth show at least one carious lesion. Each side of the mandible shows abscesses below the molars on the buccal side. In addition, the right mandible has worn away on the buccal aspect in the vicinity of the 2nd permanent molar, so that the tooth is visible. We are not confident

whether this wearing is simply weathering or due to pathological thinning of the bone, or a combination of the two.

There are several cranial pathologies noted for this individual. There are also lesions and bone loss of the maxillary alveolar process, which is to the expected given the poor condition of the dentition (Figure 26).

Cribra orbitalia is demonstrated in the left orbit, and lytic lesions and bone loss shows on the right maxilla (Figure 26). Lytic lesions with remodeling are exhibited on the right mastoid, but the condition is much more severe on the left side (Figure 27). In addition, there is bone loss on both parietals at the sagittal suture (Figure 27).

Figure 26. Individual 137. Left: bone loss, right maxilla. Right: Cribra orbitalia left frontal.

Figure 27. Individual 137. Left: bone loss, on left temporal. Right: bone loss, parietals.

Individual 138:

Context: Individual 138 came from Burial 138.

Skeletal Inventory: Right portion of sphenoid, right portion of mandible. Right clavicle. Three cervical vertebrae. Left and right tibia. Maxillary and mandibular right first deciduous molars.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is extremely Poor, most bones missing and Stages 4-5 on surviving bones.

Based on dentition, age at death was birth ± 2 months (Ubelaker 1979). A Moorrees value provides an estimate of 0.18 years (2 months). Bone fusion provides very little information to support or contradict the dental evidence. Fusion of the coronoid process and the ramus of the mandible indicates that the individual was at least 8 fetal weeks at age of death, but no other information could be gleaned from the fragmented and weathered skeletal elements present. These meager data suggest an age of death near birth.

Individual 140:

Context: Individual 140 came from Burial 140.

Skeletal Inventory: Complete cranium and mandible. Right and left clavicles, scapulae and ilia. Six cervical and 11 thoracic vertebrae; sacrum. Manubrium and four sternal bodies. Left and right humeri, right radius, left and right ulnae, left and right femora and tibia. Right fibula. Three unsided carpal phalanges and two unsided metatarsals. All deciduous teeth except for maxillary canines.

Age: Fetal

Sex: N/A

Pathology: Possible.

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 3-4), but a large number of bones are missing (e.g., lumbar vertebrae) or highly fragmented (e.g., ribs).

Based on dentition, age at death was birth ± 2 months (Ubelaker 1979). A Moorrees value provides an estimate of 0.18 years (2 months). Measurements of tibia and femur lengths indicate a fetal age, but with a wide variation (Primeau et al. 2016).

Bone fusion supports an early range provided by the dental evidence. The metopic suture of the frontals is open, as are all other cranial sutures. The greater wings of the sphenoid are not in union with the body. The temporal petrous portion does not appear to be in union with squama. The mandibular symphysis is also open.

There is crowding of the deciduous dentition. There is possible pathological thinning of the frontal bone, but the nature of fetal bone formation makes weathering a likely contributor to the hole in the bone (Figure 28).

Figure 28. Individual 140. Bone thinning and lesion, left frontal orbit.

<u>Individual 141:</u>

Context: Individual 141 came from Burial 141.

Skeletal Inventory: Left ilium and ischium. Left humerus, left radius, left ulna. Fragments. Eleven deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with most bones missing and Stage 5 recorded for the remaining bones.

Based on dentition, age at death was probably 6 months to 1 year. The teeth were too fragmentary to compare to Ubelaker or to get a Moorrees value. The dental estimate of age is based entirely on the presence/absence of teeth recovered.

No bone fusion or developmental data could be recovered. A comparison of long bone size with illustration in Baker et al. (2007:108) provides some justification for perinate.

<u>Individual 142:</u>

Context: Individual 142 came from Burial 142.

Skeletal Inventory: Both frontals, both temporals, both maxilla, right zygomatic, mandible. Left clavicle and scapula. Both ilia, six cervical, and six thoracic vertebrae. Both first 1st and left 2nd ribs, five left and 4 right ribs as well as fragments. Left humerus. All deciduous teeth.

Age: Infant

Sex: N/A

Pathology: Possible

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stages 2-5 for weathering of remaining bone.

Based on dentition, age at death was 9 months ± 3 months (Ubelaker 1979). No Moorrees value was possible.

Bone fusion supports the dental estimate. The neural arches of the cervical and thoracic vertebrae are in partial union with each other, but not with their centra, indicating first year of life. Mandibular symphysis was in union, but the metopic suture of the frontals, is open. Taken as a whole it appears that age of death for this individual was late in the first year of life.

This individual shows an anomaly of the 1st right and left maxillary molars. The crown appears to be slightly deformed (flattened lingually) and has perpendicular striae across the apical region. It does not appear to be enamel hypoplasia.

There is also possible diffuse and poorly organized bone loss on the left temporal bone, but the severe weathering of the bone makes a positive determination very tentative.

Individual 143:

Context: Individual 143 came from Burial 143.

Skeletal Inventory: Left frontal, right parietal, occipital, both temporals, sphenoid, left maxilla, left zygomatic, palatine, mandible. Left clavicle and both scapulae. Both ilia, Seven cervical, 12 thoracic, five lumbar vertebrae, sacrum. Both 2nd ribs, nine left and nine right ribs as well as fragments. All limbs except for the fibulae. One left carpal and 4 carpal phalanges. Left i^1 is the only identifiable tooth, but several fragments of indeterminate (possibly molar) teeth are present.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, but quite variable (Stages 1-4). For example, the occipital squama is missing, as is all but the petrous portions of the temporals.

No estimate of age at death is possible using dentition.

Bone fusion indicates possible fetal age: the lesser wings or the sphenoid are in union with presphenoid body, but the greater wings are not in union. Length of long bones all suggest fetal age, but with a large variation.

Individual 144:

Context: Individual 144 came from Burial 144.

Skeletal Inventory: The buccal surface of the first maxillary incisor is all that remains of this individual.

Age: Infant

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor.

Based on tooth morphology, the best estimate of the age of death of this individual is first year of life.

<u>Individual 145:</u>

Context: Individual 145 came from Burial 145.

Skeletal Inventory: Entire cranium and mandible. Left and right clavicles, scapulae, ilia, and ischia. Six cervical, 12 thoracic and five lumbar vertebrae. One sternal body. Right and left 1st and 2nd ribs, seven left and eight right ribs. Both humeri, right radius, right ulna, both femora, both tibiae. One unsided fibula fragment. Six deciduous teeth.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5). Estimated age of death of the individual based on dental development is birth ± 2 months (Ubelaker 1979). No Moorrees value could be taken.

Bone fusion and development suggest a fetal age of death. The frontal bones do not appear to have been in union. The tympanic rings of the temporals were likely fused to the squama, but the petrous portions were not fused to squama. The postsphenoid is present but the presphenoid is not; these elements may have been in union but there is no way to tell. Neither the lesser nor greater wings were fused to the body. Maximum width of the occipital pars basilarus =10.7mm, indicating an age of 32 fetal weeks. Based on these data, we conclude that the age at death was Fetal.

<u>Individual 146:</u>

Context: Individual 146 came from Burial 146.

Skeletal Inventory: Both temporals, sphenoid, right maxilla, mandible. Left and right clavicles and scapulae. Six cervical, four thoracic and three lumbar vertebrae, plus indeterminate centra and neural transverse fragments. Right 1st 2nd rib, three left and 2 right ribs, 11 indeterminate rib fragments. Right

humerus, right femur. Numerous long bone fragments. All deciduous teeth, permanent left maxillary canine.

Age: Fetal

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 2-5). Estimated age of death of the individual based on dental development is 9 months ± 3 months (Ubelaker 1979). Moorrees values on several teeth average 0.66 years (8 months).

Bone fusion and development suggest an age of death during the first year. The right petrous portion of the temporal is in union with the squama, but the suture is not obliterated. The greater wing of the sphenoid is in union. We conclude that an age of death at approximately 9 months is appropriate.

Individual 147:

Context: Individual 147 came from Burial 147.

Skeletal Inventory: Entire cranium and mandible, except for right maxilla and palatine. Left clavicle and scapula. Seven cervical, 10 thoracic and five lumbar vertebra, sacrum. Both 1st ribs, nine left and five right ribs, eight indeterminate rib fragments. Left and right humeri, left ulna, left and right femora, tibia and fibula. Eleven deciduous teeth, permanent left maxillary canine.

Age: Fetal

Sex: N/A

Pathology: Possible

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 1-2). Estimated age of death of the individual based on dental development is birth ± 2 months (Ubelaker 1979). No Moorrees values were possible. Measurement of femur length provides an estimate of fetal (Primeau et al. 2016).

Bone fusion and development suggest a late fetal age of death. All cranial sutures, including the metopic, are open. The petrous portions of the temporals are not in union with squama, and morphologically appear to be late fetal. The mandibular symphysis is open. The lesser wings of the sphenoid are in union with a complete sphenoid body but the greater wings are not. We conclude that this individual's age at death was late fetal.

There is possible pathological bone loss on the endocranial aspects of the frontal bones (Figure 29).

Figure 29. Individual 147. Bilateral-Frontals showing endocranial bone loss.

<u>Individual 148:</u>

Context: Individual 148 came from Burial 148.

Skeletal Inventory: Entire cranium and mandible, except for occipital. Left and right clavicles and scapulae, left and right ilia. Seven cervical, 12 thoracic and five lumbar vertebra, sacrum. Left 1st rib, right 2nd rib, nine left and eight right ribs, eight indeterminate rib fragments. Left and right humeri, left radius, left ulna, left and right femora. Two metacarpals and two carpal phalanges. All deciduous teeth, all permanent 1st molars, permanent right maxillary canine.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5). Along with weathering, there are notable root marks on the cranial bones, in particular.

Estimated age of death of the individual based on dental development is 3 years ± 12 months (Ubelaker 1979). No Moorrees values were possible. Measurement of left humerus length provides an estimate of 3 years ± 1.34 (Primeau et al. 2016).

Bone fusion and development suggest an age of approximately 2 years. All cranial sutures, including the metopic, are open. The frontals, maxillae, zygomatics, and sphenoid are all in union with each other. The mandibular symphysis is in union, and is nearly obliterated. The neural arches of the cervical and thoracic vertebrae are in partial union with each other but not to the centra. Based on these data, we conclude that the best estimate for age at death was 2 to 3 years.

There is pathological bone loss on both the ectocranial and the endocranial aspects of the frontal bones (Figure 30). Bone loss is diffuse, but there are well-defined lytic lesions as well. Similar lesions and bone loss are seen on the maxillae and left parietal.

Figure 30. Individual 148. Bilateral-Frontals showing endocranial bone loss and lytic lesions.

Individual 149:

Context: Individual 149 came from Burial 149.

Skeletal Inventory: Entire cranium, and mandible, except for zygomatics. Right clavicle and scapula. Seven cervical, three thoracic vertebrae, sacrum. Five right ribs. Left humerus, right femur, tibia and fibula. All deciduous teeth except for left i^1. All permanent 1st molars, permanent right I^1 and I_1.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-5).

Estimated age of death of the individual based on dental development is 1 year ± 4 months (Ubelaker 1979). Moorrees value on m_1 = 1.05 years.

Bone fusion and development supports the dental estimates. Frontals are in union, though the metopic suture is not fused. Temporal squama are in complete union with petrous portions. The mandibular symphysis is in union, and almost obliterated. The maxillae may have been in union, but are separate now. All elements of the sphenoid are in union, and the foramen ovale on both greater wings are fused. The hypoglossal canals on the occipital laterals are very close together but not quite in union. The canals should fuse between 2-4 years. Overall, these data indicate that age at death for this individual was approximately 1 year.

The pars basilarus of the occipital shows bone loss and remodeling. The frontal bones show barely discernable porotic hyperostosis, and possible cribra orbitalia (Figure 31).

Figure 31. Individual 149 Left: Occipital pars basilarus showing bone remodeling. Right: Left orbit of frontal showing possible cribra orbitalia.

Individual 150:

Context: Individual 150 came from Burial 150.

Skeletal Inventory: Petrous portion of the right temporal. Five cervical vertebrae. Left humerus, right femur, both tibiae.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with most bones missing and Stage 5 weathering on the surviving bones.

Estimated age of death of the individual based cannot be made on dental development. Length of the right tibia suggests an age of death of 2 months, but with a wide standard deviation (Primeau et al. 2016).

Bone fusion and development provide little help, except to note that none of the bones present appear to be in union. Overall, these data indicate that age at death for this individual was an infant-Perinate

Individual 151:

Context: Individual 151 came from Burial 151.

Skeletal Inventory: Entire cranium and mandible. Both clavicles, scapula, ilia, and ischia. Seven cervical vertebrae, 12 thoracic, five lumbar vertebrae; sacrum. 1st and 2nd ribs, nine left and six right ribs, manubrium and three sternal bodies. All limbs, four left metacarpals, plus six left, three right and 1 unsided carpal phalanges; 6 metatarsals and five tarsal phalanges. All deciduous teeth except for right mandibular canine. Permanent right M_1 is present.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 2-4).

Estimated age of death of the individual based on dental development is 9 months ± 3 months (Ubelaker 1979). No Moorrees values were possible.

Bone fusion data show that the neural arches of the thoracic vertebrae are in partial union with each other but not to their centra. No other vertebral elements have begun to fuse. All sutures are open. The mandibular symphysis in union. The entire sphenoid is in union (including foramen ovale). The petrous portions of the temporal are in union with squama. The hypoglossal canals on the occipital are still barely open. These fusion data are in line with first year of life development.

Length of all long bones suggest an age of death of circa 4 months, ranging from late fetal to 2 years (Primeau et al. 2016). Femur and tibia averages alone suggest an age of 8.4 months. Based on these data, we conclude that the individual's age at death was late in its first year.

Significant bone loss pathology is exhibited on the occipital squama: the bone lateral-inferior (both sides) is symmetrically eroded (Figure 32). Lytic lesions are also apparent on both temporals, parietals. There is also bone loss on both zygomatic bones. There is an abscess on the right maxilla.

Figure 32. Individual 151. Bone loss on occipital. Left= ectocranial, right= endocranial.

Individual 152:

Context: Individual 152 came from Burial 152.

Skeletal Inventory: Occipital, both temporals, right zygomatic, right maxilla, mandible. Both clavicles. Five cervical, one thoracic, and four lumbar vertebrae. Five unsided ribs. Eight deciduous teeth except for right mandibular canine.

Age: Infant

Sex: N/A

Pathology: No

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stages 4-5 weathering on remainders.

Estimated age of death of the individual based on dental development is 9 months ± 3 months (Ubelaker 1979). Moorrees value on m_1 = 0.67 years (8 months).

Bone fusion and development data are very sparse. Right mandibular oblique indicates perinatal age (Fazekas and Kosa 1978). The mandibular symphysis is in union. The petrous portion of the left temporal is in union with temporal squama. Altogether, these data indicate an age at death of 6-9 months.

<u>Individual 153:</u>

Context: Individual 153 came from Burial 153.

Skeletal Inventory: Entire cranium and mandible, minus zygomatics and palatines. Both clavicles, scapula, ilia, and sacrum. Six cervical vertebrae, 10 thoracic, and five lumbar vertebrae. Right 1st and 2nd ribs, eight left and 10 right ribs. All limbs except for left radius. Four unsided metatarsals. Hyoid bone (minus horns). All deciduous teeth present. All four permanent first molars present.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good but variable (Stages 2-5).

Estimated age of death of the individual based on dental development is 2 years ± 8 months (Ubelaker 1979). Moorrees value on mandibular canine = 2.48 years.

Bone fusion and development data support the dental age estimates. The frontals are in union, though the metopic suture is still visible. The temporals are in complete union, as is the sphenoid; the foreman ovale on the greater wings are closed. The mandibular symphysis is in complete union. The hypoglossal canals of the occipital are in union, which normally occurs during the second year.

The neural arches of cervical, thoracic and lumbar vertebrae have fused, which occurs after the first year, but only the cervical and lumbar arches have fused to their centra, which typically occurs normally in year 2-3 (Baker et al. 2005).

Based on the above data, we conclude an age of death between two to three years.

The occipital exhibits pathological bone loss and remodeling along the transverse and sagittal sinuses and the cruciform region (Figure 33). The frontal bones exhibits lytic lesions and cortical thinning, as well as healed cribra orbitalia. Both temporals exhibit non-sclerotic, but well defined regions of bone loss.

Figure 33. Individual 153 bone loss; left= right temporal ectocranial view, right=occipital endocranial view.

Individual 154:

Context: Individual 154 came from Burial 154.

Skeletal Inventory: Both frontals, temporals and zygomatics. Occipital, and sphenoid. Right parietal, right maxilla, right portion of mandible. Both clavicles, scapulae, ilia, ischia, and pubis. Sacrum, six

cervical, 12 thoracic, and five lumbar vertebrae. Right 1st ribs, seven left and nine right ribs. All limbs except for right radius. Left metacarpals and phalanges, left metatarsal and phalanges. Eight deciduous teeth present.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 1-3).

Estimated age of death of the individual based on dental development is birth ± 2 months (Ubelaker 1979). Moorrees value could not be taken.

Bone fusion and development data support the later range of the dental age estimate. The frontals are not in union, but the left temporal squama is in union with the petrous portion. The mandibular symphysis is open. Measurements of femur, tibia, and humerus length average late fetal to 2 months (Primeau et al. 2016). We conclude that age of death was Infant-Perinate.

Several cranial bones and the ilium present possible pathological bone loss, but our observations are confounded by the stage of development (i.e., fetal bone growth). The only pathology we felt strongly enough to code as pathology is on the zygomatic bones, which show poorly organized, diffuse, bone loss (Figure 34).

Figure 34. Individual 154. Left zygomatic anterior view, poorly organized bone loss.

<u>Individual 155:</u>

Context: Individual 155 came from Burial 155.

Skeletal Inventory: Both frontals, temporals, maxilla, palatines and zygomatics. Occipital, sphenoid and mandible. Both clavicles, scapulae, ilia, ischium, and pubis. Sacrum, six cervical, 12 thoracic, and five lumbar vertebrae. Left 1st ribs, right and left 2nd ribs, seven left and eight right ribs, manubrium. All limbs. Right carpals metacarpals and phalanges, left and right tarsals, metatarsal and phalanges. Eight deciduous teeth present.

Age: Fetal

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 1-3).

Estimated age of death of the individual based on dental development is birth ± 3 months (Ubelaker 1979). Moorrees value could not be taken.

Bone fusion and development data support the early range of the dental age estimate. The frontals are not in union. The left temporal squama is not in union with the petrous portion, nor are the tympanic rings articulated to squama, indicating a late fetal stage of development. The mandibular symphysis is open. Measurements of femur, and humerus length average fetal (Primeau et al. 2016). We conclude that age of death was Fetal.

Individual shows probable pathological lesions on temporals and zygomatic bones, but porosity of fetal bone makes identification tentative. However, both tibiae and fibula exhibit well defined, but not sclerotic, foci of bone loss (Figure 35).

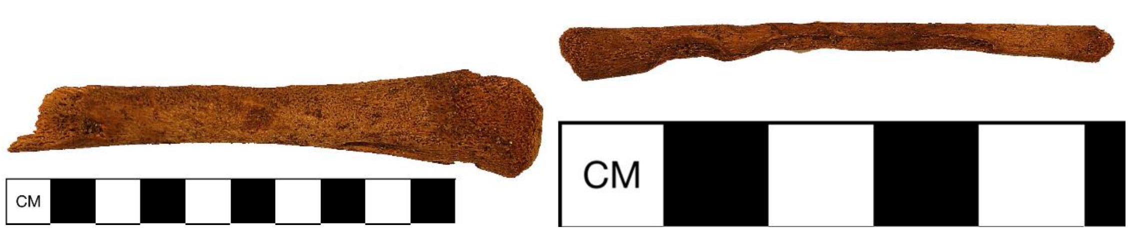

Figure 35. Individual 155. Left: Bone loss on left tibia. Right: Bone loss on left fibula.

Individual 156:

Context: Individual 156 came from Burial 156.

Skeletal Inventory: Entire cranium and mandible, minus the palatines. Both clavicles, scapulae, ilia, ischium, and pubis. Sacrum, seven cervical, 12 thoracic, and five lumbar vertebrae. Both 1^{st} and 2^{nd} ribs, nine left and eight right ribs, manubrium, one sternal body. All limbs, both right and left talus and calcaneus. Left and right carpals, metacarpals and phalanges, left and right tarsals, metatarsal and phalanges. Hyoid is present. Eight deciduous teeth are present. All eight 1^{st} and 2^{nd} permanent molars, left maxillary permanent incisors are present.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is good (Stages 1-3).

Estimated age of death of the individual based on dental development is 7 years ± 24 months (Ubelaker 1979). Moorrees value from 1^{st} left permanent incisor is 4.5 years.

Bone fusion and development data support the earlier range of the dental age estimate. The neural arches are fused to each other and to their centra in both the lumbar and cervical vertebrae, but the thoracic neural arches have not yet fused to their centra. Measurements of long bone length suggest an age of death between 4 and 5.5 years (Primeau et al. 2016). We conclude that age of death was approximately 5 years.

There is a very small carious lesion on right m^1 and another carious lesion beginning on right M_1

Both the right and left humeri show distinct bone loss and remodeling (Figure 36).

Figure 36. Individual 156. Bone loss, distal lateral anterior portions of humeri.

Individual 157:

Context: Individual 157 came from Burial 157.

Skeletal Inventory: Entire cranium and mandible. Both clavicles, left scapula, both ilia and ischia. Sacrum, five cervical, five thoracic, and two lumbar vertebrae. Left 1st rib, six left and six right ribs. All limbs, both right and left talus and calcaneus. Unsided metacarpals and phalanges, left and right tarsals and metatarsals. All deciduous teeth present. All 1st and 2nd permanent molars except for left M^2.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Good

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is varies considerably, from Poor to good (Stages 1-5). The cranium and limbs are fair to good, while much of the vertebral skeleton is fair to poor.

Estimated age of death of the individual based on dental development is 5 years ± 16 months (Ubelaker 1979). A Moorrees value returns an age of 4.95 years.

Bone fusion and development data support the dental age estimate. The neural arches of the cervical vertebrae are fused to each other and the centra, suggesting an age of at least 4 years. However, the thoracic vertebral neural arches are fused, but not fused to the centra—but that is likely observational error due to poor preservation. The two lumbar vertebrae are represented only by neural arches.

Measurements of long bone length suggest an age of death between of 5.5 years ± 1.3 years (Primeau et al. 2016). Taking all of the evidence together, we conclude that age of death was approximately 5 years.

The temporal and occipital bones show evidence for ectocranial bone loss and remodeling (Figure 37).

Figure 37. Individual 157. Bone loss and remodeling, right temporal.

Individual 158:

Context: Individual 158 came from Burial 158.

Skeletal Inventory: Entire cranium and mandible, minus the palatines. Right scapula. Sacrum, one cervical and two thoracic vertebrae. All deciduous teeth present. All four 1st permanent molars are present, left and right maxillary permanent central incisors are present.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stages 3-5), due to missing bones, weathering on cranium is fair.

Estimated age of death of the individual based on dental development is 18 months ± 6 months (Ubelaker 1979). Moorrees value from 1st left permanent incisor is 1.5 years.

Bone fusion and development data support dental age estimates. The frontals are fused, and the metopic suture is obliterated. The maxillae are in union with each other, the sphenoid and zygomatics. The left temporal is in union with the sphenoid. Frontals are in union with the sphenoid. The mandibular symphysis nearly obliterated. The temporal squama are fused to petrous portions and the juncture is obliterated. The palatines are not in union with the maxillae.

We conclude that age of death was approximately 18 months.

Both the frontals and the occipital exhibit large holes with beveling and what appears to be remodeling (Figure 38). The occipital also shows bone loss and remodeling along the sagittal sinus and the cruciform eminence.

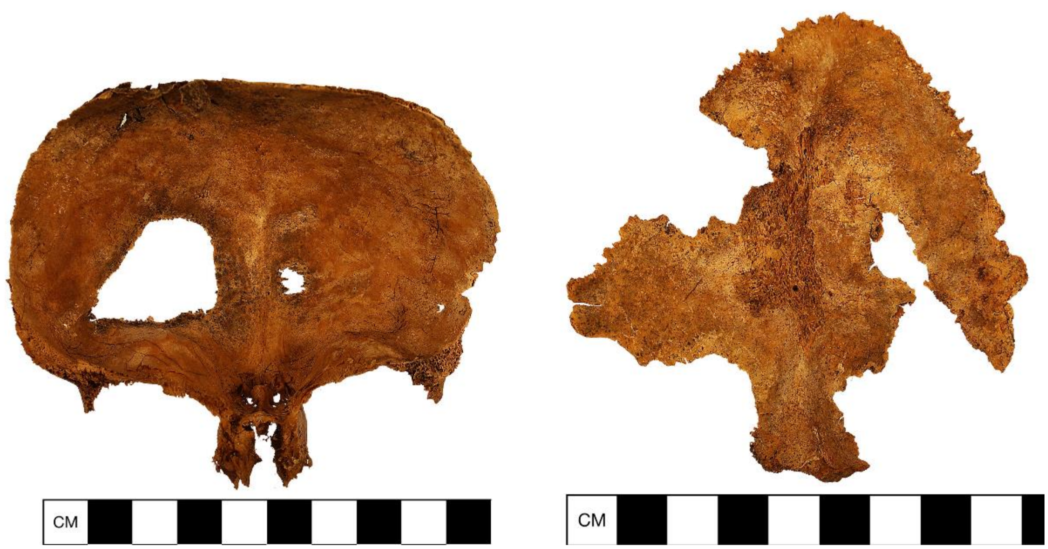

Figure 38. Individual 158. Left= endocranial view frontals, right=endocranial view occipital.

Individual 159:

Context: Individual 159 came from Burial 159.

Skeletal Inventory: Entire cranium and mandible, minus the left parietal and palatines. Right and left clavicles and scapulae. Sacrum, ilium, six cervical, 12 thoracic and four lumbar vertebrae. Both 1st ribs, left 2nd rib, seven left and five right ribs, two sternal bodies. Left humerus, both ulnae, right femur, right tibia. One malleus, two inci. Thirteen deciduous teeth.

Age: Infant-perinate

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor but variable (Stages 1-5).

Estimated age of death of the individual based on dental development is 6 months ± 3 months (Ubelaker 1979). Moorrees value returns an age of 2 months.

Bone fusion and development data suggest a fetal age to perinate. The lesser wings of the sphenoid are fused to the body, but the greater wings are open. The mandibular symphysis is also open. Taken as a whole, the data suggest an age within several months of birth.

Individual 160:

Context: Individual 160 came from Burial 160.

Skeletal Inventory: Occipital, both temporals, sphenoid, right zygomatic, left maxilla, left portion of mandible. Left scapula. Sacrum, left ilium, left pubis. Seven cervical, 11 thoracic and two lumbar vertebrae. Left 1st ribs, five left and six right ribs. Left humerus, left radius, left ulna, both femora. Two stapes, one malleus. Six deciduous teeth present.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor but variable (Stages 2-5) with many missing bones.

Estimated age of death of the individual based on dental development is birth ± 2 months (Ubelaker 1979). No Moorrees value was possible.

Bone fusion and development data suggest Infant-Perinate. All cranial sutures appear open, none of the neural arches have fused together.

The pars basilarus of the occipital shows what appears to be a bone remodeling (Figure 39).

Figure 39. Individual 160. Occipital pars basilarus. Reactive bone. Left=superior, Right=inferior.

<u>Individual 161:</u>

Context: Individual 161 came from Burial 161.

Skeletal Inventory: The entire cranium and mandible, minus the parietals. Left clavicle and scapula. Four cervical and eight thoracic vertebrae. Left 1st rib, two left and two right ribs.

Age: Fetal

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stages 4-5 for the remainder.

No dental estimate of age could be made due to a lack of teeth. The mandibular symphysis is open as are the frontals. The tympanic rings are in union with squama but the petrous portions are not. The greater wings of the sphenoid are not in union with the body. The maximum width of the occipital basilarus is 12.94mm, maximum length is 11.58mm, indicating an age of death at 34-38 fetal weeks.

The scant data we have from one fusion and development data suggest an age of death of fetal.

Individual 162:

Context: Individual 162 came from Burial 162.

Skeletal Inventory: Right frontal, left temporal. Two thoracic vertebrae fragments. One left rib, rib fragments. Left ulna.

Age: Fetal

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stage 5 for the remainder.

No dental estimate of age could be made due to a lack of teeth. The morphology of the temporal pars petrosa indicates an age of death at 7 fetal months.

Individual 163:

Context: Individual 163 came from Burial 163.

Skeletal Inventory: Occipital, both temporals, sphenoid. Right scapula, left ilium, sacrum. Six cervical, 11 thoracic, and five lumbar vertebrae fragments. Both 1st ribs, left 2nd rib, nine left and 10 right ribs. Left ulna, right tibia, right fibula, two unsided metacarpals, two unsided metatarsals. Deciduous left mandibular incisor fragment.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stage 5 for the remainder.

No dental estimate of age could be made due to a lack of teeth. The fusion of the lesser wings, sphenoid body, and presphenoid indicate an age of at least birth. The greater wings are not in union, indicating that this individual is not older than 1 year. We conclude from these scant data that age of death is within the first year.

Individual 164:

Context: Individual 164 came from Burial 164.

Skeletal Inventory: Left frontal, both temporals, sphenoid, left maxilla. Seven thoracic vertebrae fragments. Three left and five right ribs. Both femora, both tibiae, carpal phalanges. Seventeen deciduous teeth.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones; weathering is variable (Stages 1-5) on the remaining.

Age of death based on dentition is 9 months ± 3 (Ubelaker 1979). A Moorrees value from the first maxillary molar gives an estimate of 0.46 years (5-6 months).

Bone fusion supports the dental estimates. The neural arches of the thoracic vertebrae are not in union with each other, indicating the individual is in the first year. Temporal squama and petrous portions are in union, also indicating first year. The frontal bones are not in union and it is not clear if the greater wing of the sphenoid was in union with the body. Based on these data, we conclude that the age at time of death between 6-9 months.

The maxilla, sphenoid and temporal bones all show lesions, while the frontal bone exhibits porotic hyperostosis.

Individual 165:

Context: Individual 165 came from Burial 165.

Skeletal Inventory: Entire cranium and mandible. Left clavicle, both scapulae, both ilia, sacrum. Seven cervical, 11 thoracic and five lumbar vertebrae. The 1st left rib, seven left and nine right ribs. All limbs, left metacarpals and phalanges. Left and right metatarsals. Ten deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: Possible

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, but variable (Stages 1-5). Root etching is noticeable on the lower limbs.

Age of death based on dentition is birth ± 2 (Ubelaker 1979). A Moorrees value provides an estimate of 0.18 years (2 months).

Bone fusion supports the dental estimates. No vertebral neural arches are in union with each other. Temporal squama and petrous portions are in union, but the frontal bones are not in union, the mandibular symphysis is open, and the sphenoid is not in union with the greater or lesser wings. Long bone length measurements suggest fetal age, but with very large standard deviations. Based on these data, we conclude that the age at time of death was Infant-Perinate.

Possible lytic lesion on the parietal, but the combination of young bone growth and weathering makes this observation tentative.

Individual 166:

Context: Individual 166 came from Burial 166.

Skeletal Inventory: Temporals, left and right femora. Indeterminate fragments. Seventeen deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and Stages 4-5 for remainder.

Age of death based on dentition is 6 months ± 3 months (Ubelaker 1979). Moorrees values on two teeth indicate 0.25 years (3 months). No other means to age the individual is possible due to very poor preservation. We conclude that this individual died between 3-6 months of age.

Individual 167:

Context: Individual 167 came from Burial 167.

Skeletal Inventory: Entire cranium and mandible, minus left zygomatic and both palatines. Right scapula, seven cervical, 12 thoracic, and five lumbar vertebrae; sacrum. Right 1st rib, two left and three right ribs and fragments. Left femur, left tibia, multiple long bone fragments. Sixteen deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: Possible.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, but variable. Cranium is rated Stage 2, but most of remaining elements are Stages 4-5.

Age of death based on dentition is birth ± 2 (Ubelaker 1979). A Moorrees value from the mandibular canine gives a value of 0.26 years (3 months).

The bone union and development data support the dental estimates. The metopic suture of the frontals are open. Temporal petrous portion are not in union with squama. The mandibular symphysis is open. The greater wings of the sphenoid are not in union with the body but the lesser wings are. Altogether, these data indicate an age of death of the first three months of life.

The occipital laterals are highly porous near the supra-occipital borders. The left frontal has a large hole, which may be the result of pathological cortical thinning in conjunction with root activity, but we cannot say this with certainty.

Individual 168:

Context: Individual 168 came from Burial 168.

Skeletal Inventory: Left temporal sphenoid, left palatine, right portion of mandible. Two thoracic neural arches, one left and one unsided fragments. Left humerus, right ulna, both femora, left tibia, both fibulae. Right mandibular deciduous incisors.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, (Stages 4-5).

Age of death based on dentition is birth ± 2 (Ubelaker 1979). No Moorrees value.

The bone union and development data support the dental estimates. The mandibular symphysis is open. The petrous portion of the temporal is not in union with squama. Length of the right tibia indicates an approximate age of 1 month (Primeau et al. 2016). Based on these data, we conclude that the best estimate of age of death is Infant-Perinate.

<u>Individual 169:</u>

Context: Individual 169 came from Burial 169.

Skeletal Inventory: Left frontal, occipital, both temporals, right maxilla, and mandible. Both ilia, sacrum. Three cervical, six thoracic, and there lumbar vertebra. Six left and 10 unsided rib fragments. Both femora, left tibia, four right carpals two carpal phalanges . All mandibular deciduous teeth except for right canine. All right maxillary deciduous teeth. Right maxillary and mandibular first permanent molars.

Age: Infant-Perinate

Sex: N/A

Pathology: None noted

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, (Stages 2-5).

Age of death based on dentition is six months ± 3 months (Ubelaker 1979). No Moorrees value. The mandibular symphysis is in union; petrous portions of the temporal bone are in union with squama. Based on these data, we conclude that the best estimate of age of death is Infant-Perinate.

<u>Individual 171:</u>

Context: Individual 171 came from Burial 171.

Skeletal Inventory: Entire cranium and mandible, minus left parietals and left zygomatic and right palatine. Left scapula and clavicle, seven cervical, 11 thoracic, and five lumbar vertebrae. Left 1st rib, six left and three right ribs and fragments. Left humerus, multiple fragments. All deciduous teeth except for right i^2.

Age: Infant

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, (Stages 3-5).

Age of death based on dentition is 6 months ± 3 (Ubelaker 1979). Moorrees values range from 0.25 (3 months) to 0.45 (5 months)

The bone union and development data support the dental estimates. The mandibular symphysis is open. The petrous portion of the temporal is not in union with squama. Length of the right tibia indicates an approximate age of 1 month. Based on these data, we conclude that the best estimate of age of death is between birth and 6 months.

Individual 172:

Context: Individual 172 came from Burial 172.

Skeletal Inventory: Left frontal right temporal, occipital, both maxilla. Long bone fragments. All deciduous teeth except for right m_2 and i_1. Permanent right I^1.

Age: Infant

Sex: N/A

Pathology: None noted.

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor (Stage5) for the few bones that were recovered.

Age of death based on dentition is 1 year ± 4 months (Ubelaker 1979). Moorrees values not possible due to broken nature of teeth.

No bone fusion or developmental data could be observed.

Based on the dental data, we conclude that the best estimate of age of death is Infant.

Individual 173:

Context: Individual 173 came from Burial 173.

Skeletal Inventory: Cranium and mandible, except for occipital, sphenoid, and palatines. Both scapulae, both ilia, ischia, and pubis. Sacrum, 11 thoracic vertebrae. Right 1st rib, eight left and seven right ribs. All limbs, both tali, left calcaneus. Left and right carpals, metacarpals and phalanges. Right metatarsals. All deciduous teeth. Permanent right and left M^1.

Age: Infant

Sex: N/A

Pathology: None noted.

Taphonomy: fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with wide variation (Stages 1-5). For example, cranium=1, long bones=3-5.

Age of death based on dentition is 18 months ± 6 months (Ubelaker 1979). Moorrees values were not possible to obtain. Femur and tibia length measurements provide an average of 1.6 years, but a range of 2 months to 3 years (Primeau et al. 2016). Frontals are in union with the metopic suture barely visible. Frontal/parietal articulation is open. The thoracic and lumbar vertebral neural arches are fused to each other but not their centra indicating an age between 1-2 years (Baker et al. 2005).

Based on the dental and bone data, we conclude that the best estimate of age of death is Infant, most likely in the second year.

Individual 176:

Context: Individual 176 came from Burial 176.

Skeletal Inventory: Complete cranium and mandible. Both scapulae and clavicles, both ilia, and ischia. Sacrum, seven cervical, 12 thoracic, four lumbar vertebrae. Right and left 1st and 2nd ribs, eight left and 11 right ribs. Manubrium and two sternal bodies. Left and right humeri, right ulna, left and right femora, left tibia. Unsided long bone fragments. Unsided carpals, metacarpals and phalanges. Unsided tarsal fragment. All deciduous teeth except for mandibular canines. Permanent right M^1.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with a lot of variation (Stages 1-5).

Root etching is notable on the cranium, missing and/or highly fragmented limb bones.

Age of death based on dentition is 6 months ± 3 months (Ubelaker 1979). Moorrees value returns an age of 0.25 years (three months). Frontals are not in union. The tympanic ring of the left temporal is in union with squama, but the petrous portion is not. The greater wings of the sphenoid are not in union with the body. Based on the dental and bone data, we conclude that the best estimate of age of death is 3-6 months.

Both the temporals and the lateral elements of the occipital show lytic lesions and remodeling (Figure 40).

Figure 40. Individual 176. Right and left temporal bone lytic lesions, medial view.

Individual 177:

Context: Individual 177 came from Burial 177.

Skeletal Inventory: Both frontals, parietals and temporals. Occipital, sphenoid, and mandible. Left clavicle, left ilium, five cervical, six thoracic vertebrae. Left 1st and 2nd ribs, two left and seven right ribs, unsided rib and fragments. Unsided long bone fragments. Five deciduous mandibular teeth.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with a lot of variation (Stages 3-5).

Root etching is notable on the cranium.

Age of death based on dentition is 6 months ± 3 months (Ubelaker 1979). Moorrees value returns an age of .046 years (six months). Frontal bones are not in union. The petrous portion of the right temporal is in union with squama. The mandibular symphysis is in partial union. The greater wings of the sphenoid are not in union with the body. Based on the dental and bone data, we conclude that the best estimate of age of death is probably 6 months.

Both the temporals show lytic lesions, while the frontal bones indicate porotic hyperostosis and possible cribra orbitalia (Figure 41).

Figure 41. Individual 177. Left temporal lateral view, lytic lesions. Right, left orbit cribra-orbitalia.

Individual 178:

Context: Individual 178 came from Burial 178.

Skeletal Inventory: Entire cranium and mandible, minus right parietal. Both clavicles and scapulae, both ilia, right ischium, sacrum. Six cervical, 9 thoracic, five lumbar vertebrae. Left and right 1st ribs, six left ribs, unsided ribs. Both humeri, right ulna, both femora, both tibiae. All deciduous mandibular teeth, six deciduous maxillary teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with a lot of variation (Stages 3-5).

Root etching notable on many elements.

Age of death based on dentition is 6 months ± 3 months (Ubelaker 1979). Moorrees values return an age range of 0.25 (3 months), 0.39 (five months), and .045 years (six months). Bone fusion data also suggest mid-first year. The mandibular symphysis is open. None of the neural arches of the vertebrae have fused. The sphenoid body is missing, but a complete left greater wing is present, suggesting that the greater wings and body were not in union. Based on the dental and bone data, we conclude that the best estimate of age of death is 6 months to 1 year.

A Carabelli's cusp appears on the maxillary 2nd molars. Additionally, there may be a general coalescence variation that gives the appearance of as many as 6 cusps, though whether these would have developed into true 6th cusps is unclear. Both the temporals show lytic lesions, while the frontal bones indicate porotic hyperostosis and possible cribra orbitalia (Figure 42).

Figure 42. Individual 178. Bilateral bone loss and lytic lesions of the temporals. Left- left, Right= right. Both show significant weathering, the right more severely.

Individual 179:

Context: Individual 179 came from Burial 179.

Skeletal Inventory: Entire cranium and mandible, minus palatines. Both clavicles and scapulae, both ilia, right ischium, right pubis. Six cervical, 10 thoracic, five lumbar vertebrae. Three left, three right, one unsided, ribs. All limbs, both tali, both calcanei. Two unsided metacarpals, right and left tarsals, metatarsals, and tarsal phalanges. Deciduous maxillary molars, all permanent teeth present except for I^2.

Age: Child

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with a lot of variation (Stages 1-5).

Root etching is notable on the cranium.

The age of death based on dentition is 12 years ± 36 months (Ubelaker 1979). However, the difference in crown heights of the molars suggest the individual was closer to 12 years than to 15. A Moorrees value from M_3 provides an estimate of 10.9 years.

Bone fusion and development data support the dental estimates. Cervical, thoracic and lumbar neural arches are fused to themselves and to their centra. The ossiculum terminalis is in union with the dens of the axis vertebra, which happens by circa 12 years (Baker et al 2007:77), but epiphyseal fusion of long bones or vertebrae has not yet begun.

Long bone length measurements (Primeau et al. 2016) indicate an average age of 11 years with a range of 9-12. Combined, the data suggest an age of death at circa 11 years.

There are some interesting dental developmental issues. The permanent right 2^{nd} P^2 and right maxillary right C both have deciduous teeth articulated in front of them (i.e., right maxillary c and m^2). These two teeth, however, are loose and reveal the developing permanent dentition underneath. In addition, the left permanent lateral incisor (I^2) appears to have never developed and is missing. The left central incisor (I^1) appears slightly winged and overlaps the right central incisor (I^1) buccally.

Caries are noted on both $M_1$and the right M_2. Calculus is also noted on the left P_2 and M_1 as well as left P^2 and M^1.

Skeletal pathologies include alveolar bone loss and resorption in both mandible and maxillae (Figure 43). In addition, lytic lesions are evident on the axis vertebra and significant bone loss and remodeling of the occipital (Figure 44).

Figure 43. Individual 179. Bone loss and resorption, mandible and maxillary alveolar processes. Left=mandible. Right= left maxilla.

Figure 44. Individual 179. Left=axis vertebra, anterior view. Right= endocranial view of occipital.

<u>Individual 180:</u>

Context: Individual 180 came from Burial 180.

Skeletal Inventory: Most of the cranium and mandible minus the right zygomatic. Both clavicles and scapulae, both ilia, sacrum. Seven cervical, 12 thoracic, five lumbar vertebrae. Both 1st and 2nd ribs, 6 left, 6 right, two unsided, ribs. One sternal body. Both humeri, right radius, right ulna, both femora, both tibiae. All deciduous teeth.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair, with a wide range of variation (Stages 1-4).

Age of death based on dentition is 9 months ± 3 months (Ubelaker 1979). No Moorrees value was possible, but the mandibular central incisors are more elevated than the lateral incisors, supporting the Ubelaker estimate. Additionally, the maxillary 1st molar is broken, but enough remains to state that incipient root development was taking place at time of death.

Bone fusion and development data support the dental estimates. Thoracic and lumbar neural arches are fused to themselves but not to their centra. Cervical neural arches have not yet fused at all. Long bone length measurements (Primeau et al. 2016) of the humerus suggest 3 months, while measurements of the femur suggest 5 months, but with a large standard deviation.

A comparison of femora with illustrations in Baker et al. (2005:113) indicate this individual is between birth and 1.5 years. Taken together, we conclude this individual's age at death was 6 months to 1 year.

The individual has bowed femora (Figure 45). In addition, both temporals show bone loss and lesions (Figure 46).

Figure 45. Individual 180. Left=Right femur exhibiting bowing, anterior view. Left= Left femur exhibiting bowing, anterior view.

Figure 46. Individual 180. Left= Left temporal, lateral view, right= right temporal, lateral view.

Individual 182:

Context: Individual 182 came from Burial 182. Burial 182 appears to truncate Burial 1, but there is no evidence of commingled remains.

Skeletal Inventory: Both frontals, both temporals, right zygomatic, occipital, sphenoid, right maxilla, right zygomatic. Both clavicles and scapulae, both ilia, sacrum. Seven cervical, 12 thoracic, five lumbar vertebrae. Both 1st and 2nd ribs, six left, six right, two unsided, ribs. One sternal body. Both humeri, right radius, right ulna, both femora, both tibiae. All deciduous teeth.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 3-5).

Age of death based on dentition is 9 month ± 3 months (Ubelaker 1979). No Moorrees value was possible. The maxillary 1st molar is broken, but enough remains to state that incipient root development was taking place at time of death, which also supports an age of circa 9 months.

Bone fusion and development data support the dental estimates. None of the neural arches are fused. The frontal bones are not in union. The petrous portions of the temporals are in union with squama. The

lesser wings are in union with the body, but the greater wings are not. Taken as a whole, the data indicate an age of death of approximately 9 months.

The right temporal is similar to others in this population, where there is a large lytic lesion on the expanded mastoid region of the petrous portion that expands out through the temporal squama (Figure 47). The left temporal is too weathered to make a confidant determination of pathology.

Figure 47. Individual 182. Right-Temporal showing lesions, lateral view.

Individual 183:

Context: Individual 183 came from Burial 183.

Skeletal Inventory: Both frontals, both temporals, left maxilla, occipital, sphenoid, mandible. Left clavicle. Seven cervical, eight thoracic, two lumbar vertebrae. Five left, three right, two unsided, ribs. Indeterminate long bone fragments. Seven deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and weathering (Stages 3-5) on the remainder.

Age of death based on dentition is birth ± 2 months (Ubelaker 1979). No Moorrees value was possible.

Bone fusion and development data support the later range of the dental estimate. No neural arches of the vertebrae are fused. The petrous portions of the temporals are fused to squama. The coronoid process is fused to the mandible but the mandibular symphysis is open. The sphenoid body is separated from presphenoid and neither the lesser or the greater wings are in union. Taken together, these data indicate an age of death at early in the first year.

The heavily weathered temporals exhibit well-bounded, but not sclerotic, lesions and bone remodeling (Figure 48).

Figure 48. Individual 183. Right and left temporals showing lesions, lateral view.

Individual 184:

Context: Individual 183 came from Burial 183.

Skeletal Inventory: The entire cranium and mandible except for the palatines. Left clavicle, both scapulae, both ilia, ischia and pubis. Seven cervical, 12 thoracic, four lumbar vertebrae. Both 1st ribs, right second 2nd rib, four left, seven right ribs. Both humeri, right ulna both femora, tibiae and fibulae. Both tali and calcanei. Four carpal phalanges. All deciduous teeth present. All four first permanent molars present.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 2-4).

Age of death based on dentition is 2 years ± 8 months (Ubelaker 1979). No Moorrees value possible.

Bone fusion and development data support the later range of the dental estimate. The entire cranial vault is in union. The metopic suture of the frontal is obliterated. Lateral portions of the occipital have fused to the squama, but the hypoglossal canal is still open. Petrous portions of the temporals are fused to squama. Neural arches of the cervical vertebrae are in partial union to each other but not to the centra. Neural arches of the thoracic vertebrae are in full union to each other but not to the centra. Neural arches of the lumbar vertebrae are in partial union to each other as well as their centra. Taken together, these data indicate an age of death at 2-3 years.

The left frontal bone shows a cluster of lytic lesions, while the temporals exhibit well-bounded, but not sclerotic lesions and bone remodeling (Figure 49).

Figure 49. Individual 184. Left frontal lytic lesions, endocranial view.

Individual 185:

Context: Individual 185 came from Burial 185.

Skeletal Inventory: Occipital, both temporals, left palatine. Left scapula, both ilia, right ischium. Two cervical, 10 thoracic, five lumbar vertebrae. Four left, one unsided, ribs. Both humeri, left ulna. Both femora and tibiae. Left fibulae. Indeterminate upper limb diaphysis fragment (either ulna or radius), other long bone fragments.

Age: Fetal

Sex: N/A

Pathology: No

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor, with many missing bones and variable weathering (Stages 3-4) on remaining bone.

Age of death based on dentition is not possible. The petrous portions of the temporals are not in union with squama. Long bone comparisons to illustrations in Baker et al. (2005) compare favorably to a late fetal age (3rd trimester).

Individual 186:

Context: Individual 186 came from Burial 186. N.B. A taphonomically distinctive left rib from the limits of the burial shaft was recovered with this body. That bone is not included in this description. Burial 186 was disturbed by a (pre-archaeological) excavation (now known as Feature1), and it is likely that this disturbance introduced the rogue rib into Burial 186.

Skeletal Inventory: All cranial except for parietals. Right clavicle, both scapulae, right ilia, sacrum. Seven cervical, 11 thoracic, five lumbar vertebrae. Both 1st and 2nd ribs, seven left, seven right ribs. Both humeri, both radii, left ulna. Both femora, left tibiae. Five unsided metacarpals and 15 carpal phalanges. Three left metatarsals. Seven deciduous teeth.

Age: Fetal

Sex: N/A

Pathology: No

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stage 2).

Age of death based on dentition is 7 fetal months ± 2 months (Ubelaker 1979). No Moorrees value was possible.

Bone fusion and developmental data also suggest a fetal age. The petrous portions of the temporals are not in union with squama. The frontals are not in union. The presphenoid and postsphenoid do not appear to have been in union. The lesser wings are in union with presphenoid, but the greater wings are open. The mandibular symphysis is open. Long bone measurements (Primeau et al. 2016) all indicate fetal age. Comparison with long bone illustrations in Baker et al. (2005) compare favorably with 3rd trimester fetal age. Taken together, we conclude this individual's age at death was late fetal.

There is a lesion on the distal diaphysis of the left femur (Figure 50). The left temporal also shows bone loss, as do the frontal bones.

Figure 50. Individual 186. Distal portion of left femur showing lesion, anterior view.

<u>Individual 187a:</u>

Context: Individual 187a came from Burial 187.

Skeletal Inventory: All cranial except for parietals. Left portion of mandible. Both clavicles, both scapulae, both ilia, ischia, pubis. Sacrum, seven cervical, 11 thoracic, five lumbar vertebrae. Both 1st and 2nd ribs, nine left, eight right ribs.

All upper limbs, both femora. Three left and five right metacarpals 8 left and 9 right carpal phalanges carpal phalanges. Three left metatarsals. Eight deciduous teeth.

Age: Infant-Perinate

Sex: N/A

Pathology: Yes

Taphonomy: Fair

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is fair (Stages 1-4), but variable weathering, root etching. Missing lower extremities of skeleton.

Age of death based on dentition is birth ± 2 months (Ubelaker 1979). A Moorrees value of 0.25 years (3 months) was obtained from right M_1.

Bone fusion and developmental data also suggest perinatal age. All cranial sutures are open. Temporal petrous portions are in union with squama. The individual shows incomplete coalescence of the

permanent 1st mandibular molar cusps. Long bone measurements (Primeau et al. 2016) indicate late fetal age, but with a large standard deviation. Comparison of long bone size with illustrations in Baker et al. (2005) compare favorably with perinatal age. Taken together, we conclude this individual's age at death was very near birth.

Both temporals show sclerotic lesions, while there is also a lytic lesion, with corresponding bone loss of the surrounding area. (Figures 51-52).

Figure 51. Individual 187a showing sclerotic lesions on temporals, ectocranial view.

Figure 52. Individual 187a showing occipital lesion, thinned bone, endocranial view.

Individual 187b:

Context: Individual 187b came from Burial 187.

Skeletal Inventory: Right scapula, both ilia, ischia, pubis. Sacrum, one cervical, two thoracic, one lumbar vertebrae. Three unsided ribs.

All upper limbs, both femora. Four unsided carpal phalanges.

Age: Indeterminate

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with many bones missing. Variable weathering (Stages 2-4) on remaining bones.

Bone fusion and developmental data provide little information. This individual's age is indeterminate, but likely fetal or perinatal.

Individual 999:

Context: Individual 999 came from Feature 1.

Skeletal Inventory: Both frontals, right parietal, left temporal, occipital. Right scapula, both ilia, left pubis. One thoracic vertebra. Five left, one right ribs. Left femora, left fibula.

Age: Infant

Sex: N/A

Pathology: Yes

Taphonomy: Poor

Cultural Affiliation: Euroamerican

Summary:

Preservation of the individual is poor with many bones missing. Variable weathering (Stages 1-4) on remaining bones.

No age determination could be made using dentition as there were no teeth recovered. Bone fusion and developmental data provide a little information. The frontal bones are in union and the metopic suture is almost obliterated. The petrous portion of the temporal bone is in union with squama. The thoracic vertebral neural arch is in incomplete union, but not with the centra. While scant, these data suggest the individual is an infant circa 2 years old.

The frontal bone shows cortical thickening at the frontal process and what appear to be lytic lesions near the metopic suture (Figure 53). The left temporal bone shows well defined, but not sclerotic, lesions.