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The Health Status of Early 20th Century Blacks from the Providence Baptist Church Cemetery (40Sy619) in Shelby County, Tennessee

Rebecca J. Wilson
University of Tennessee - Knoxville

To the Graduate Council:

I am submitting herewith a thesis written by Rebecca J. Wilson entitled "The Health Status of Early 20th Century Blacks from the Providence Baptist Church Cemetery (40Sy619) in Shelby County, Tennessee." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Anthropology.

Lee Meadows Jantz, Major Professor

We have read this thesis and recommend its acceptance:

Richard L. Jantz, Lyle W. Konigsberg

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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Acceptance for the Council:

Anne Mayhew

Vice Chancellor and Dean of Graduate Studies

(Original signatures are on file with official student records.)

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A Thesis
Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Rebecca J. Wilson
May 2005

Dedication

To the lost, but not forgotten. May you one day hold your proper place in history.

Acknowledgements

I wish to thank everyone who has helped me in completing my Master of Arts degree in Anthropology.

Thank you to my committee, Dr. Lee Meadows Jantz, Dr. Richard Jantz, and Dr. Lyle Konigsberg, for putting up with my stubbornness and incessant questions. I would especially like to thank Dr. Lee Meadows Jantz with providing me the opportunity to work on this project and becoming a great friend and mentor in the process.

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Abstract

Paleopathological investigations of health are an important component in the construction of a population's history. Such studies make possible analyses regarding Black health in the late 19th and early 20th centuries, a time period where the availability of relevant and objective literature is limited. Also, these investigations permit a comparison between similar populations to determine the extent to which the demographic, social, economic, and political conditions of this time period affect a specific population.

This study compares the Providence Baptist Church cemetery in Shelby County, Tennessee to two contemporary historic Black cemeteries in order to address an urban versus rural dichotomy suggested by Davidson et al. (2002). The Cedar Grove cemetery, located in rural Arkansas, and the late-period Freedman's cemetery, located in Dallas, Texas, were used for the comparison. Comparisons of the skeletal and dental indicators of stress across these samples, using data from the Western Hemisphere Database (Steckel et al. 2002), help place the Providence Baptist Church skeletal series in relation to the other sites. A series of pair-wise chi-tests was employed to determine significant differences at the 95 percent confidence level, between the populations for the frequency and severity of each skeletal indicator of stress.

The Providence Baptist Church cemetery demonstrates a high incidence of degenerative joint disease, moderate infectious lesions, few dietary or metabolic disorders, and little trauma. When compared to the other populations, the pathology frequencies indicate a population that is not clearly associated with either the rural or

urban condition as defined by Davidson et al. (2002). Significant variation among the three sites was observed with each stress indicator examined. The Providence population demonstrated a relationship with the Cedar Grove Cemetery for osteoarthritis, and with Freedman's Cemetery for indicators of metabolic stress. The results for trauma and infection were inconclusive, but a possible relationship between Cedar Grove and Providence for trauma and between Freedman's and Providence for infection was noted.

These pathological conditions indicate a rural community that is augmenting its health status by taking advantage of the resources at its disposal. This suggests that other factors, such as a direct church affiliation, an association with Masonic organizations, or the proximity to the Memphis metropolitan area affected the population's health.

Table of Contents

List of Tables

List of Figures

Figure Page

Chapter 1
Introduction

The Providence Baptist Church Cemetery (40Sy619) was discovered in 2003 during runway improvements at the Memphis-Shelby County Airport. Because it is an unmarked cemetery with little historical documentation confirming its existence, this cemetery represents a common scenario in historic bioarchaeological investigations. Literature gathered confirms that the congregation represents an historic Black population from the early 20th century. The Black population, especially during the late 19th and early 20th centuries, is drastically under-reported in the historical record necessitating comprehensive archaeological investigations when possible. This investigation focuses on the health, as expressed skeletally, of those interred at the Providence Baptist Church Cemetery in relation to the expected health of the time period and relevant comparative cemetery populations.

The history of post-reconstruction Blacks is limited by the paucity of records documenting their health, diet, and daily activities. The inadequacy of historic records, from lack of data collection or even the misinterpretation of conditions, stimulates an interest in substantiating existing records as well as adding to them (Ubelaker 1995). As Leslie Rankin-Hill (1997) notes, there is a plethora of historical research on slave systems and slavery with regards to origin, economy, emancipation, and reconstruction, but limited research for the period after the Civil War. She notes five areas of research that have been ignored in Black studies: the heterogeneity of the Black population; antebellum urban slaves and freedmen; living conditions, health status, and life styles of non-slave Blacks; the changing socio-cultural conditions realized through industrialization; and the health status and bio-adaptability of Blacks (Rankin-Hill 1997). This research focuses on the fifth area, the health status and bioadaptability of Blacks, particularly that of late 19th and early 20th century Blacks.

When written records are present they are often plagued by inaccuracy, underreporting, or observer bias making it difficult to determine how Blacks in the late 19th and early 20th centuries mediated their health under the prevailing social, political, and environmental conditions of this time period. Research has been published describing the slave experience and its comparison to the free Black and reconstruction populations (Stampp 1956, Kiple and King 1981, Fogel and Engerman 1974), but little is understood about the post-reconstruction period in Black history dating between 1870 and 1930. Rose (1989) indicates historical records provide minimal assistance to the analysis of historic Black skeletal series, especially in the South. Historical documentation of the Black community, in relation to its health, is the worst between 1880 and 1920 in the rural South (Rose 1985). Between 1850 and 1920, there was legalized segregation and defective or non-existent death records resulting in disease and dietary records plagued by the recorder's lack of knowledge, bias, and error (Rose 1989). For example, the state of Tennessee did not require death records until 1914, and the state was not incorporated into the vital records registration area until 1917 (Coomer 1920). Conditions under slavery can be derived from various sources, such as plantation records, manifests, and other specific sources; however, descriptions of post-emancipation conditions are scarce in the literature. After the Civil War and reconstruction started, plantation owners were no longer documenting slave status and the data that was collected on the Black population was subjective at best (Kiple and King 1981). Northern urban areas had established numeration methods to better document this population, but in the South very few of the urban districts and even fewer of the rural areas established such a system.

Inadequacies of the current literature regarding Black health in post-reconstruction America require studies within and between contemporaneous Black populations from the late 19th and early 20th centuries. Recent research has suggested variations in the Black experience regionally, sociopolitically, and temporally. Rathbun and Steckel (2002) note a regional variability in enslaved and emancipated Afro-Americans. Steckel and Rose (2002) note not only regional variability, but a sociopolitical variability. Boyd and Boyd (2004) demonstrate diachronic trends in the health of Virginian Blacks over a 240 year period. Davidson et al. (2002) note a diachronic variation within a single population, as well as differences in health indicator rates between the urban and rural situation.

A comparison of the Providence Baptist Church Cemetery population from Shelby County, Tennessee, to other Black populations will better elucidate the health of this skeletal series in relation to the health of Blacks during post-reconstruction. A combination of archival research and the assessment of these skeletal remains allows for the discernment of the population's health status, since the skeleton has the unique ability to retain physical characteristics of health, diet, and socio-cultural practices that have occurred over an individual's life (Owsley 1997). This bioarchaeological analysis, focusing on indicators of stress, will describe and contextualize the health of individuals interred at the Providence Baptist Church Cemetery in relation to other late 19th and early 20th century Black populations. Additionally, this analysis will determine the impact of the Providence Baptist Church's locality, the sociopolitical condition of the area, and community organizations, on the overall health of the population.

The Providence Baptist Church

The Providence Baptist Church Cemetery is currently located in the Oakville suburb of Memphis, Shelby County, Tennessee on the Memphis-Shelby County Airport property (Figure 1). The Providence Baptist Church was organized in 1886 (Shelby County, 1941). According to deed records of the cemetery property, on July 27, 1899, the church leaders William Branch, Joe Wyatt, and Gustus Glover, bought a one acre plot of land from T. N. Ward and Louise D. Ward for $100. In the 1899 deed, the property was described as follows:

> Beginning at the Northeast corner of J.M. James 202 ½ acre tract where the Hollyford Road crosses the Southern boundary of the L.B. Suggs 560 acre tract thence running west along said Southern boundary 300 feet to a post and wire fence, thence South along said wire fence 150 feet to a post and wire fence, thence East along said wire fence 300 feet to Hollyford Road, thence North 150 feet along said Hollyford Road to the beginning one acre, more or less, and situated in the 13 civil district (Shelby County Archives 1899).

This land was described as a 300 by 150 yard plot in the northeast corner of the Ward's 202 acre tract of land. It is unclear how the Wards came to own the property prior to their selling of the small plot to the Providence Baptist Church. A church building was not clearly indicated on the land until a soil survey map identified it as such in 1916. (see Figure 2).

Archival research indicates that the Providence Baptist Church was located on the site circa 1899 to 1933. Archaeological investigations estimate the use of the excavated area of the cemetery between 1900 and 1935 with the probability of an even earlier use of

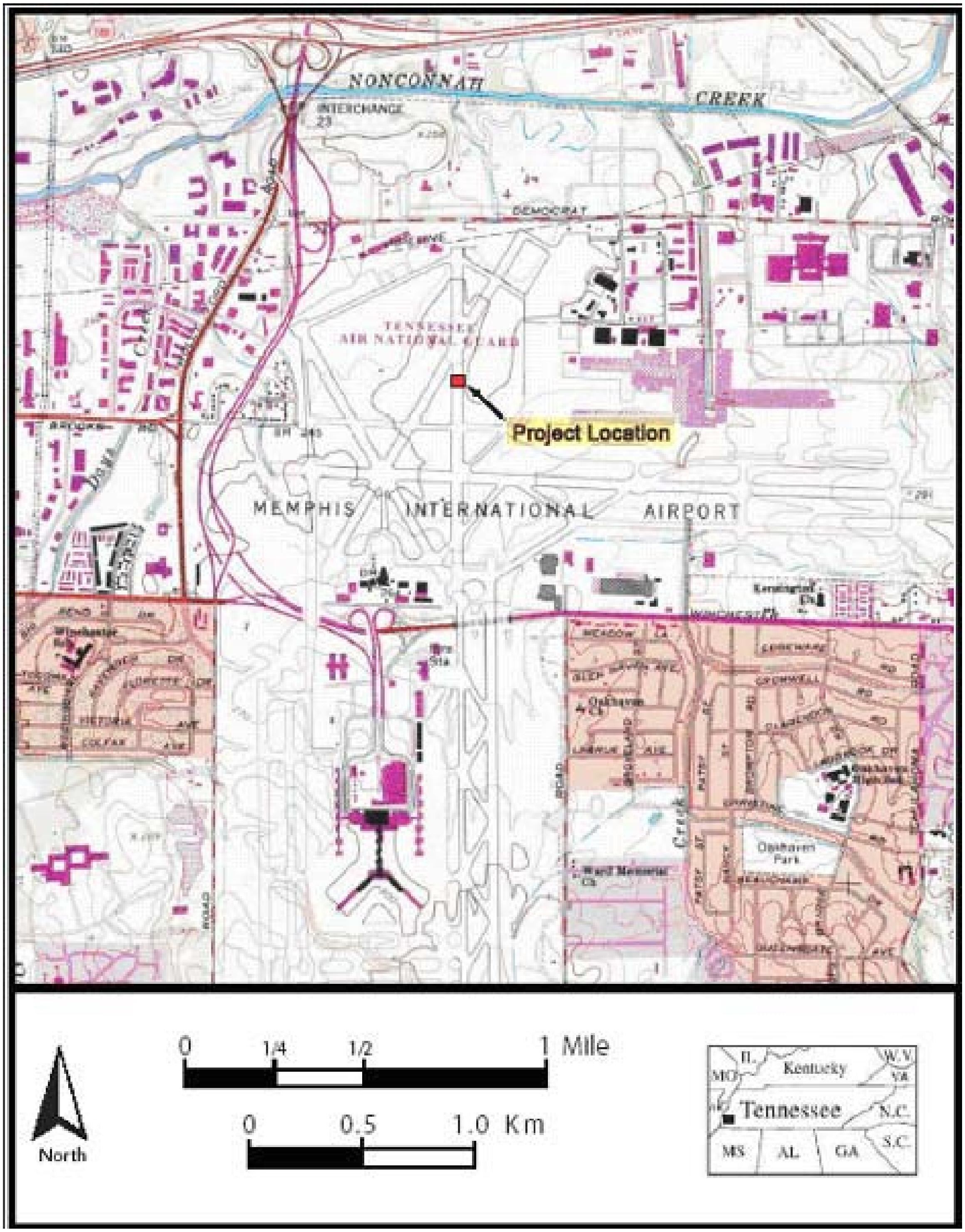

Figure 1: Location of the Providence Baptist Church Cemetery on the Memphis International Airport Property (USGS 1965 in Oster et al. 2004).

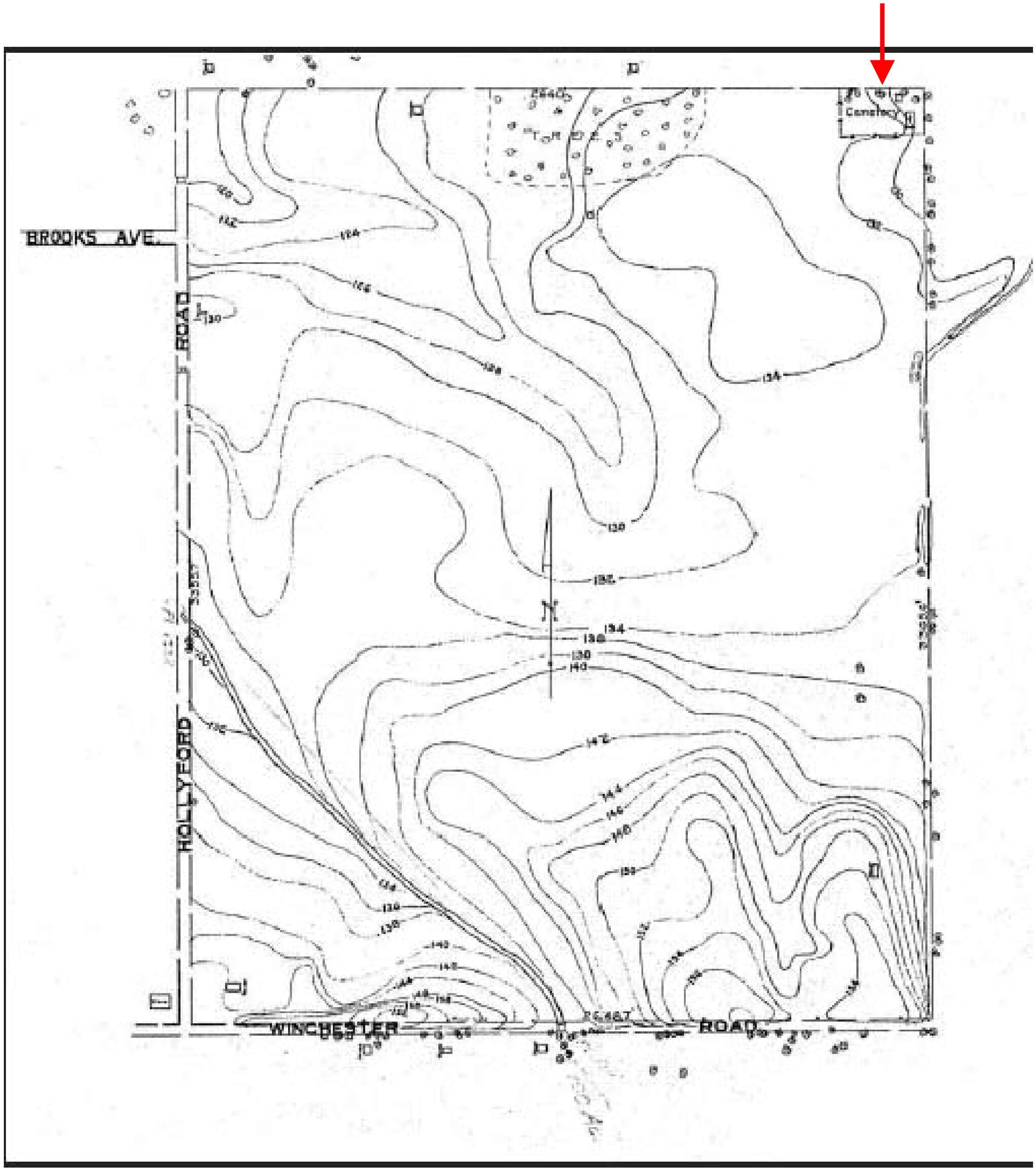

Figure 2: Topographic Map of the Ward Property. The church is outlined in the northeast corner (Tennessee Geological Survey 1916 in Oster et al. 2004).

the land as a cemetery prior to its actual purchase by the church leaders (Oster et al. 2004). However, all artifacts recovered thus far suggest that the excavated area is from the middle to latter part of the cemetery's use with the last identified interment occurring in 1932. Using the coffin hardware as a basis for dating, most burials are clearly situated in this time period with a majority of these dating in the 1920s (Oster et al. 2004).

In the 1920s, the Public Development Board identified the Ward property, including the one acre Providence Baptist Church lot, as a possible location for a proposed municipal airport. In 1928, a 200 acre tract was obtained by the city via a lease, which included most of the Ward property (Anonymous 1928). A 1928 survey and contour map identifies that a cemetery was located in the northeast corner of the property. This is again the case in a 1929 drainage map and a 1931 drawing of the now open Municipal Airport the latter of which clearly identifies the northeast corner area of the Ward property as a "cemetery lot" (Fowler 1929, see Figure 3). In 1933, the church sold their one acre to the city for $650 listing Robert Holmes, Eddie W. Holmes, Tom Vernon, Will Beasley, and Arthur Lane as the Church Board selling the land. This same land was again sold to the city in 1935 as part of the Ward property following the death of Louise Ward.

A series of aerial photographs between 1937 and 1940 note the disappearance of the cemetery and the new runway expansions. In 1937 no structures were evident on the land, but a cemetery was still present. An overlay to this same map shows a proposed northern runway expansion, which would cross the cemetery site. Aerial photographs from 1938 demonstrate the removal of the cemetery fencing and earth disturbances on the cemetery (see Figure 4). This is the first map not defining the land as a cemetery.

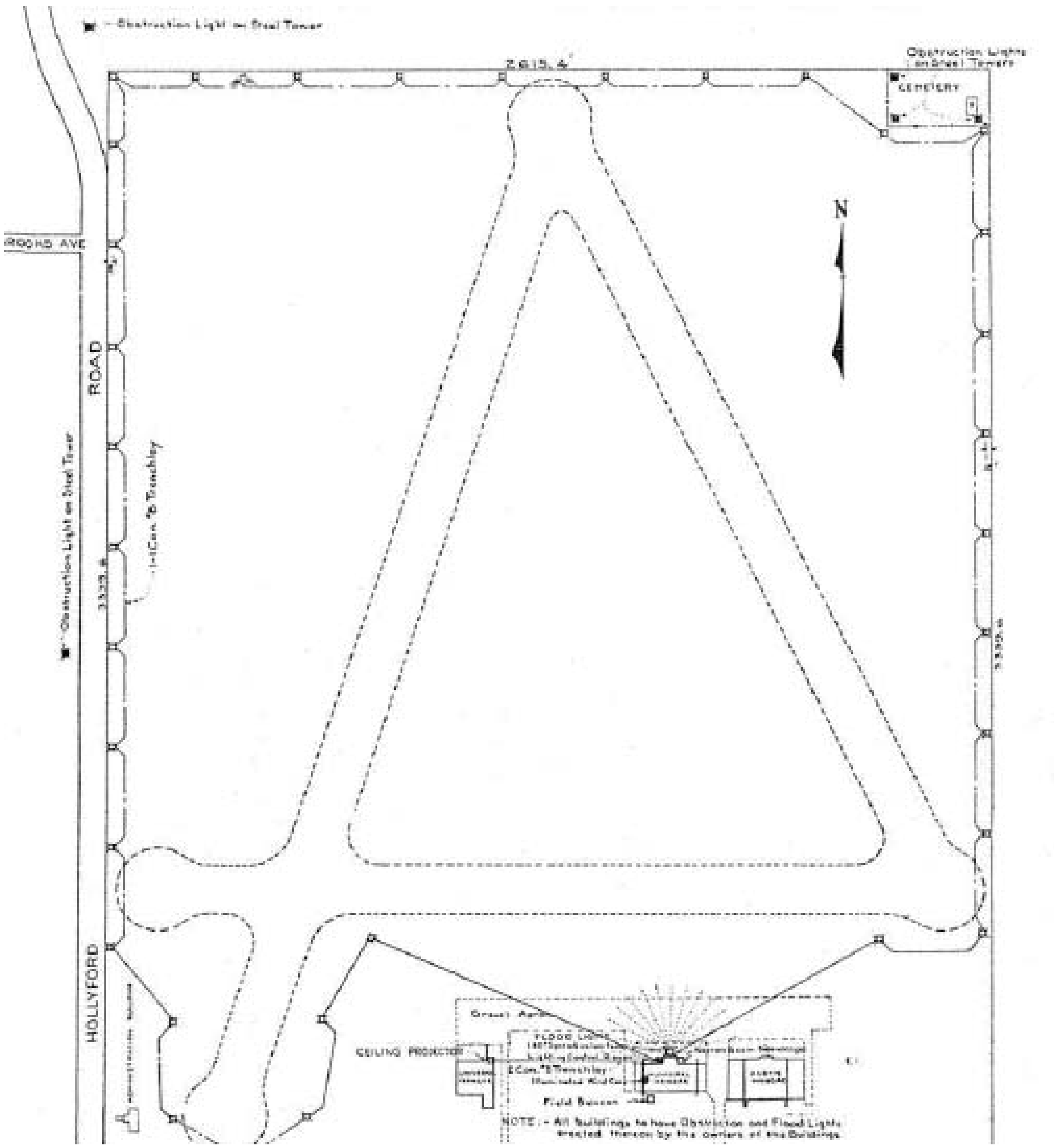

Figure 3: City Engineering Department Map of the Memphis Airport and the Providence Baptist Church Cemetery (Fowler 1929).

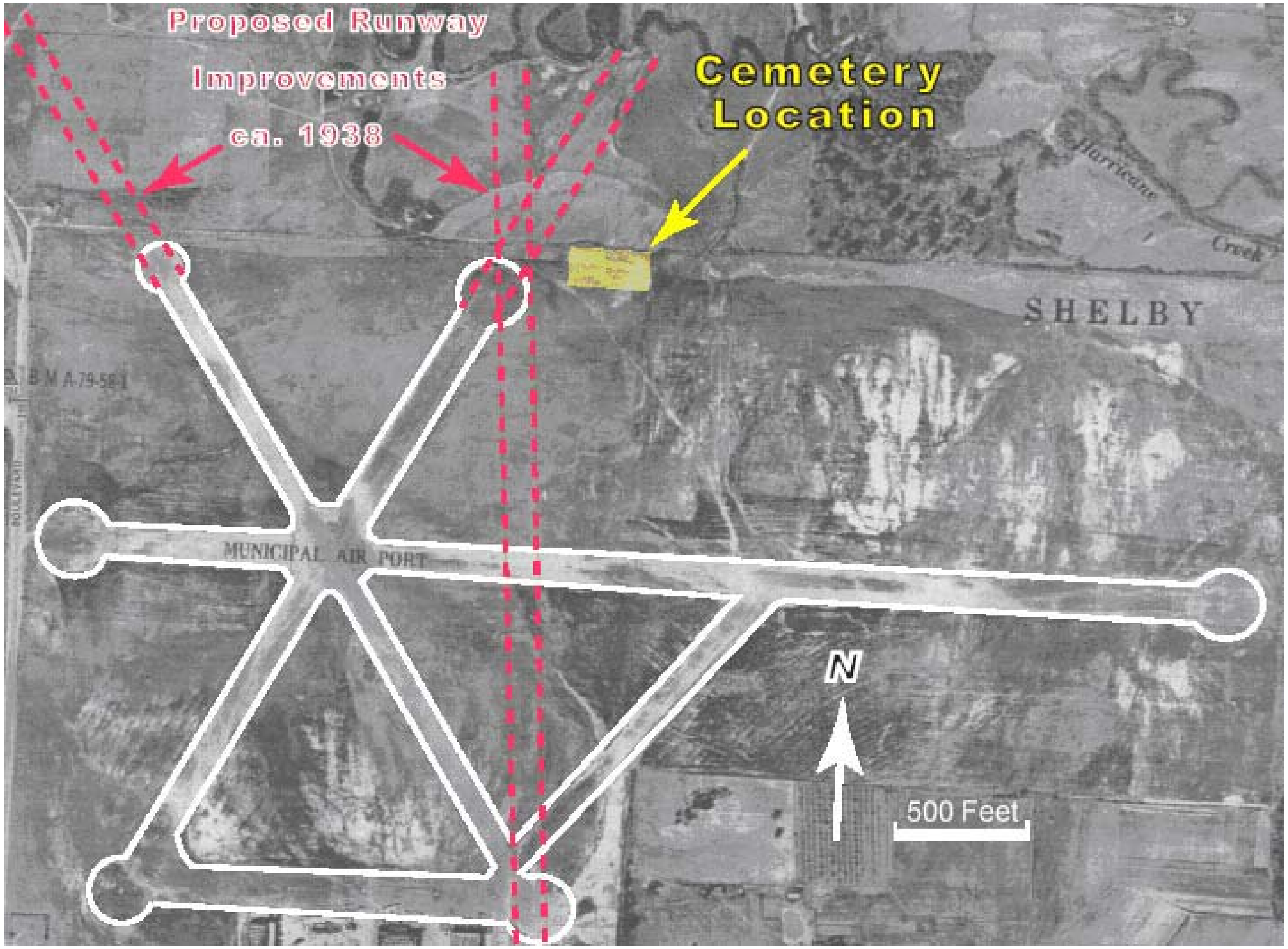

Figure 4: Map of Proposed Runway Construction at the Memphis Municipal Airport (Tobin 1938 in Oster et al. 2004).

Photographs from 1939 depict the planned runway in progress bisecting the one acre cemetery lot. The 1940 photographs of the same area show the now completed north-south runway over most of the unmarked cemetery (see Figure 5).

The church, suggested to be associated with the cemetery, was listed in the city directory at another location in 1935, then again in 1940, and in 1953 the name and address changed altogether. As it is known today, the Providence Missionary Church is situated away from the airport with no associated cemetery. It is unclear if this current church has any relationship to the original Providence Baptist Church.

Archaeology of the Providence Baptist Church Cemetery

The Providence Baptist Church Cemetery was discovered during renovations and expansion of the existing Runway "C" between the current Federal Express and Tennessee National Guard areas of the Memphis-Shelby County Airport. Excavations conducted in March of 2003 by Weaver & Associates unearthed approximately 20 percent of the cemetery directly impacted by construction. This area consists of 65 burials containing 62 individuals, and church grounds (see Figure 6). The remaining church lot is covered by several layers of gravel, concrete, and asphalt, since it is below the existing runway. Historical literature research clearly demonstrates the presence of the Providence Baptist Church and its cemetery from 1900 to 1938 at this location. Analysis of the archaeological material and artifacts from the cemetery is ongoing by Weaver & Associates. Preservation of the skeletal remains and associated artifacts ranges from excellent to fragmentary with

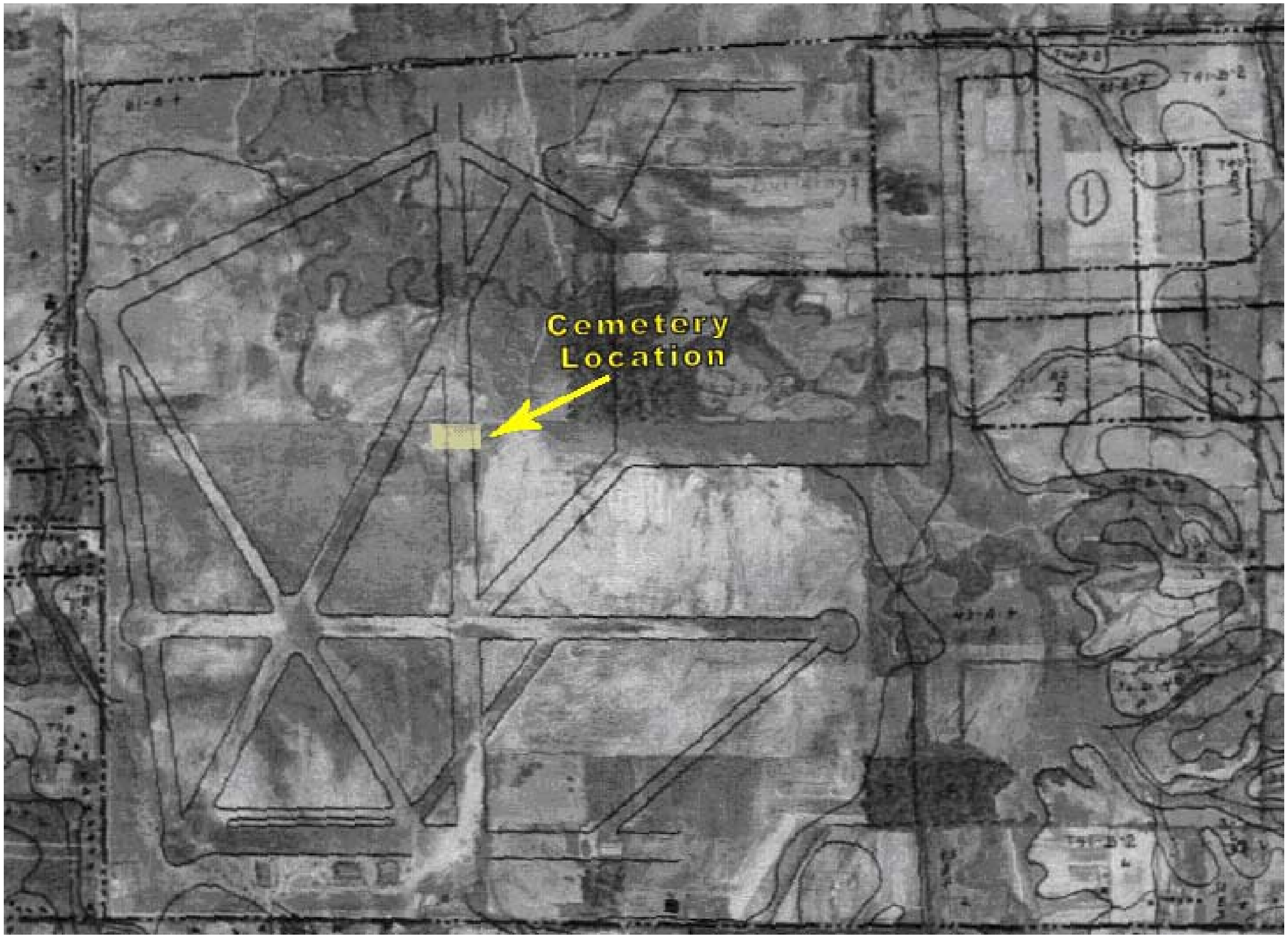

Figure 5: 1940 aerial photographs of the Memphis Municipal Airport. The cemetery location is highlighted in yellow (Tobin 1940 in Oster et al. 2004).

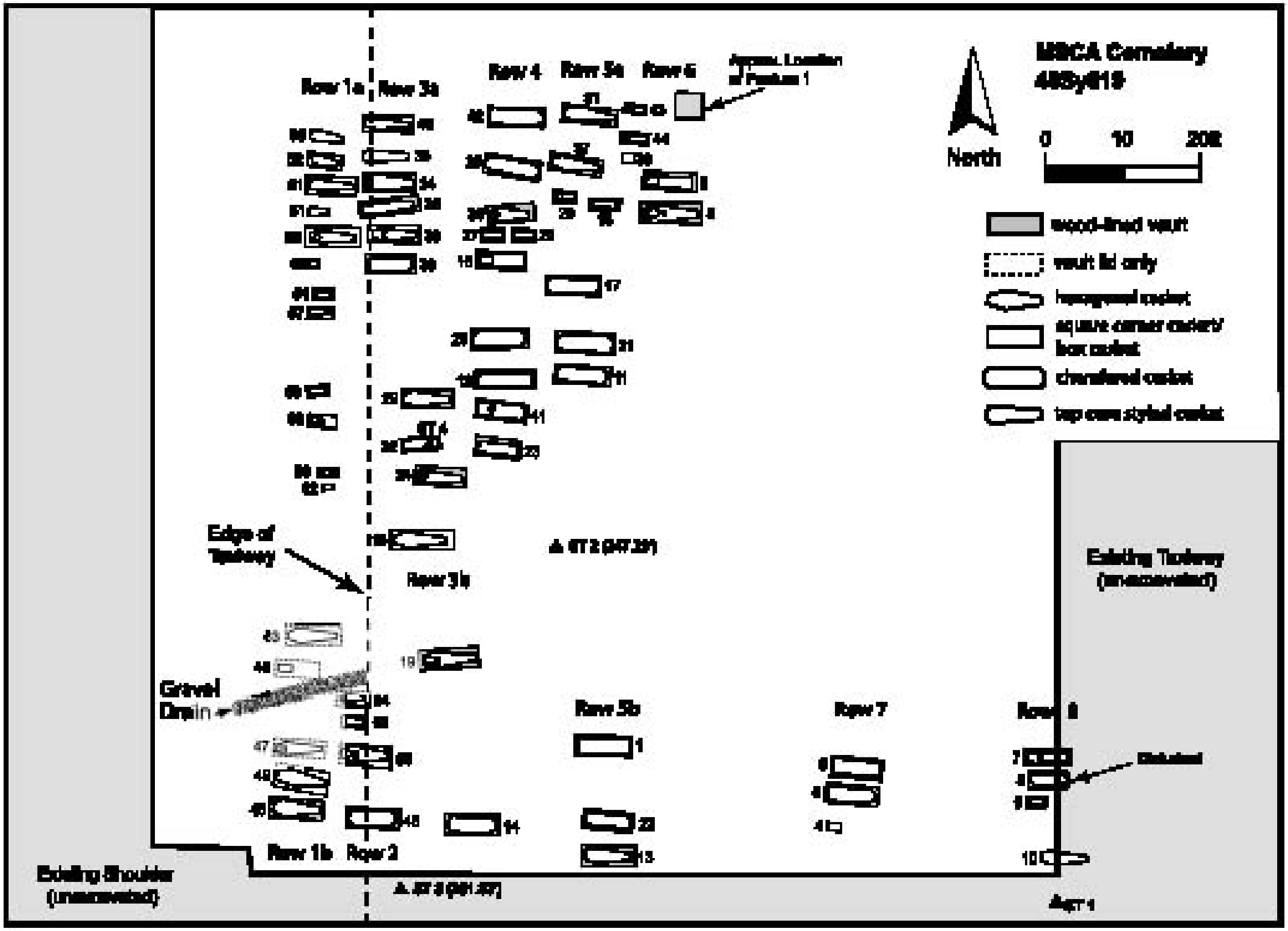

Figure 6: Excavated area of the Providence Baptist Church Cemetery (Oster et al. 2004)

most individuals represented by several well preserved skeletal elements. One tombstone dating to 1926 was recovered from excavation backfill, and represents a 13 year old female, Frankie LeFlore (Oster et al. 2004). Most individuals excavated had associated personal artifacts or other materials. In fact, several pieces of newspaper were recovered and were able to be transcribed (Oster et al. 2004). Two of these newspaper clippings led to the discovery of obituaries of the individuals interred, Frank Green and Eliza Wyatt (Oster et al. 2004). Other individuals were identified through death certificate research, including Alex Moore and Gustus Glover, one of the original founders and church leaders. Further historical research is being conducted in an attempt to identify other individuals and learn more about the church population. Refer to Appendix A for a photograph of the tombstone, newspaper clippings, and death certificates for these individuals.

Preservation of the Skeletal Material

Preservation of the remains ranges from poor to excellent with most damage resulting from taphonomic factors. The quality and condition of most coffins and vaults prevented commingling and made isolation of burials easier. Burials located under the runway were protected the best, even though extensive pressure from plane activity occurred above the burials. Previous grading may have acted as a buffer. Those burials adjacent to the existing runway and in the drainage paths experienced the most damage.

Differential preservation also was evident in the coffin type and burial technique. Those individuals in simple pine box coffins and little vault formation were the least preserved, while those in the more elaborate coffin styles displayed the best preservation. Most skeletal material had light to dark brown staining consistent with coffin burials. Several individuals had a radio-opaque blue-black substance, vivianite, on the skeletal elements. The archaeological report for the United African Methodist Episcopal Church (UAME) in Wilmington, Delaware (Hazel 2000) describes a similar substance and notes that it is typically associated with an urban context due to the leeching of soil materials or as a product of embalming.

Chapter 2
The Providence Baptist Church Community

Life in the Memphis Area

The city of Memphis and Shelby County were established in 1819. The population continually increased as a result of the migration west from Virginia, Kentucky, and Georgia. Between 1840 and 1850 the population grew drastically in response to the increasing role of Memphis in the national and regional trade, and its proximity to the Mississippi delta. Statistics for Shelby County, Tennessee are limited. The first comprehensive collection of data describing the population was not completed until 1947. Comparable data, which is available in the County Data Book of 1947, is only found through United States census reports for the total US population and the city of Memphis, Tennessee.

Federal forces occupied Memphis for much of the Civil War, which helped to offset destruction and the postbellum rebuilding period. However, during the 1870s a series of epidemics decimated the population. The 1878-1879 yellow fever epidemic was responsible for the fleeing of 25,000 individuals with 5,000 congregating in camps outside the city, over 5,000 deaths, and the loss of the city charter in 1879. Memphis was not re-incorporated until 1893. Between 1890 and 1920 Memphis saw another population expansion resulting in Memphis being considered the 3rd largest city in the South by 1900. Table 1 highlights the population growth Memphis experienced. Much of the later population growth was a product of the urbanization of the rural Black community in which there was a large migration to urban centers.

Table 1: Memphis population growth from 1880 to 1920 (Coomer 1930).

Year	Total Population	% White	% Black
1880	33, 592	---	---
1890	64, 495	---	---
1900	102,320	76.2	23.8
1910	131,105	78.3	21.7
1920	162,351	80.7	19.3

In 1940, Shelby County's population distribution consisted of 292,942 urban dwellers, 23,875 rural non-farming dwellers, and 41,433 rural farming dwellers for a total of 358,250 individuals (Hansen 1947). The locality of the Providence Baptist Church and its proximity to downtown Memphis suggest that the congregation may have represented a rural non-farming community in Shelby County rather than Memphis.

Vital statistics for the Memphis area indicate that most of the Black population not involved in agricultural activities were employed in menial and unskilled tasks. By 1920, agriculture was still the predominant employment opportunity for Tennessee Black males with 360,000 individuals; domestics came in second with 180,910; and mining, manufacturing, trade, and transportation completed the top occupations (Coomer 1920). Black female occupations were domestics at 56,000, followed by agriculture at 36,000, and finished out by manufacturing and clerical jobs (Coomer 1920). From 1880 and 1920 there was a shift from agriculture to manufacturing. In 1880, 49.4 percent of the Black population of the Unites States was employed in agriculture, while only 25.6 percent were employed in manufacturing (Coomer 1920). By 1920, only 27.2 percent of Blacks were involved in agriculture with 33 percent employed in manufacturing (Coomer 1920).

The Providence Baptist Church property was not incorporated into the Memphis city proper until the late 1920s in response to the recent opening of the Memphis Municipal Airport, suggesting that the congregation was from the surrounding rural Shelby County area rather than the urban districts making agriculture, domestics, and laborers the expected occupations for the cemetery population.

The Role of the Church in the Black Community

The church played a significant role in the Black community acting as a buffering mechanism to potentially volatile daily experiences. Specifically, the church and other benevolent societies substantiated the Black existence by providing people with identification, values, and security (Engerman 1977).

> For two basic reasons the all-black church has long been recognized as the key institution of the community: first, an oppressed and downtrodden people used religion for spiritual sustenance and for its promise of a better life in the next world; second, with the ability to participate in the political, social, and economical spheres of the larger White society in which they lived sharply curtailed, blacks turned to the church for fulfillment of their secular needs.
>
> Important in the twentieth century, the church was vital to blacks in the 19th. … blacks were so closed off from the benefits of White society that church affiliation became a fundamental prerequisite to a decent, and indeed, bearable existence (Hershberg 1975: 405-406).

The church not only fulfilled the secular needs of the black community, it played a significant role in healthcare and medical needs. J. S. Levin (1984) notes that the Black population experienced excesses of morbidity and mortality, especially in the South where there were severe deficits in access to health care. As such, the church played and still plays a significant role in the health of the Black community. Black churches have served as places of worship, meeting places for fraternal organizations, and loci of community organizations (Levin 1984). People turned to the church in times of need, because the church is charged with preserving the health of its constituents. The historical role of the church in relation to the Black ethos justifies the argument that medicine is incorporated within the Black church (Levin 1984).

Benevolent societies, often associated with or working through the church, played a significant role in the Black ethos as well. These 'secret' societies identified themselves as either active, goal oriented or ceremonial. Black societies were predominantly in the form of lodges or fraternal orders, most of which were almost exclusively ceremonial. E. N. Palmer (1944) states most of the fraternal orders "care for the sick and bury the dead," which was a significant function not being performed by society in general. Benevolent societies sprang up throughout the country, especially in the South, following the Civil War. The post-reconstruction period represented the pinnacle of their existence pioneering Black cooperative efforts, including laying the foundation for Black owned banks, insurance companies, and other commercial enterprises (Palmer 1944).

Unfortunately, little is known about the structure and membership of these groups in the archaeological record. The Providence Baptist Church Cemetery is unique in this aspect since archaeological investigations have been able to identify at least one individual (Burial 21) with clear evidence of an association to a fraternal order. A Masonic medal was found pinned to the individual's suit and consisted of upper and lower suspension bars at the ends of a ribbon, and a planchet (Oster et al. 2004). The upper suspension bar is decorated and stamped with the Masonic order "Daughters of Tabernacle." An identical medal features a blue ribbon with the inscription "International Order of Twelve" (Lettelier 2003). The openwork planchet, hanging from the lower suspension bar, is comprised of a five-point star superimposed over a circle. The star is inscribed with the Masonic numeral "333" (see Appendix A). The medal is associated with the Knights of Tabor or the International Order of Twelve. The International Order of Twelve was established by Moses Dickson in 1871, and was related to the Knights of Liberty, an antislavery group that played a prominent role in the Underground Railroad movement. The goal of the Knights of Tabor was to enhance liberty and opportunity for ex-slaves. Membership requirements were quite stringent. Candidates were required to join a local church, secure a basic education, and buy property if financially able (Giggie 2001). The Knights of Tabor membership was also full of pageantry and rituals to the extent that members had uniforms and medals indicating rank and role, members performed drills, and funerals of members were highly organized events. Members were rewarded with financial and health security through the underwriting of insurance policies, providing loans, and aiding families of the sick (Giggie 2001).

Benevolent societies such as this one enabled Blacks to become successful and thrive in an otherwise hostile environment. They provided Blacks with a sense of community, security, and the benefits associated with membership. It is for this reason that it is necessary to discuss both benevolent society and church membership in an evaluation of the health of a Black American population.

Chapter 3
Defining the Health of a Population

Health is intertwined with demographic, social, economic, and political change making it important to not just study the intimate details of a particular skeletal series, but to do comparative studies of the remains in their historical, economic, ecological, and cultural contexts (Maish et al. 1997). Understanding the context from which a skeletal population is derived will produce a more comprehensive analysis.

Late 19th Century Black Health

Post-reconstruction, especially in the South, brought about a turbulent time for Blacks. They faced segregation, inequality, and unequal access to resources and healthcare creating stressful environmental and socioeconomic conditions affecting the overall health of the Black population. A major argument is that there is a decrease in health after the Civil War resulting from the disruption of the economic benefits of slavery. Martha Mitchell (1944) notes that a positive selection for health would have occurred under slavery since health equated to money. A slaveowner's wealth would have been correlated to the health of his slaves because plantations needed a labor force capable of working the fields. Unfortunately, sanitation and housing were poor and crowded making them a major source of disease and epidemics (Mitchell 1944). Fogel and Engerman (1974) support this argument by stating that slavery was a profitable, low-cost system in which slave health was equal to the White counterpart. Furthermore, they believe that exaggeration of slavery's harshness produces a false preconception that

Reconstruction was better (Fogel and Engerman 1974). In actuality, post-bellum southern Blacks witnessed a 10 percent decrease in life expectancy and a 20 percent increase in illness by the 1890s (Fogel and Engerman 1974).

The patterns of mortality and morbidity for the post-reconstruction period are rooted in the historical context and determined by health resources, which are tied to economic, political, and social trends of the time period. In the limited research conducted most researchers suggest that free Blacks faired worse than their European counterparts and little better than slaves (Kiple and King 1981). This was particularly the case for the post-reconstruction South since constraints were placed on mobility, there were limited educational opportunities, and restricted access to the political system (Farley 1970). Post-reconstruction was marked by a loss of the Black healthcare system, no civil services besides the short-lived Freedmen's Bureau, and the general loss of value of the Black workforce. "Accounts of rural living conditions stress the difficulty most Blacks faced keeping themselves alive … noting the shortages of food, the prevalence of disease, and the lack of medical services in rural areas" (Farley 1970). Hence, only modest changes occurred for southern Blacks between the Civil War and the Great Depression (Beardsley 1987).

The end of the 19th century was marked by an overall increase in the Black population, while it was experiencing an overall decline in the fertility rate as described in Table 2. Between 1900 and 1920, 30 percent of Black women never had children. Similar declines in birthrates of Western nations occurred between 1880 and 1940 as a result of rapid economic growth, urbanization, and industrialization (Engerman 1977).

Table 2: Fertility and Mortality in the United States, 1860-1930 (from Davidson et al. 2002, Table 9.3, p. 234).

Approximate Date	Birthrate[a]		Child-woman ratio[b]		Total Fertility Rate[c]		Expectation of Life[d]		Infant Mortality Rate[e]	
	White	Black[f]	White	Black	White	Black[f]	White	Black[f]	White	Black[f]
1860	41.4	55.0[g]	905	1072	5.21	7.58[g]	43.6	--	181.3	--
1870	38.3	55.4[h]	814	997	4.55	7.69[i]	45.2	--	175.5	--
1880	35.2	51.9[i]	780	1090	4.24	7.26[j]	40.5	--	214.8	--
1890	31.5	48.1	685	930	3.87	6.56	46.8	--	150.7	--
1900	30.1	44.4	666	845	3.56	5.61	51.8[j]	41.8[j]	110.8[j]	170.3[j]
1910	29.2	38.5	631	736	3.42	4.61	54.6[k]	46.8[k]	96.5[k]	142.6[k]
1920	26.9	35.0	604	608	3.17	3.64	57.4	47	82.1	131.7
1930	20.6	27.5	506	554	2.45	2.98	60.9	48.5	60.1	99.9

a Births per 1,000 population per annum.
b Children aged 0-4 per 1,000 women aged 15-44, taken from U.S. Bureau of Census (1975), Series B67-68.
c Total number of births per women if she experienced the current period age-specific fertility rates throughout her life.
d expectation of life at birth for both sexes combined.
e infant deaths per 1,000 live births per annum
f Black and other population for CBR (1920-1990), e0 (1950-1960), IMR (1920-1970).
g average for 1860-1869.
h average for 1870-1879.
i average for 1880-1884.
j Approximately 1895.
k Approximately 1904.

S. F. Tolnay (1986) noted a sharp residential variation in Black fertility in which the rural areas required a large labor force encouraging high fertility, while in the urban setting the family relied heavily on income outside the household making children more of a liability. Also, Tolnay (1986) observed a relationship between place of residence (listed as rural, urban, or rural non-farming) and differences seen in mortality and fertility in the 1900 census. However, Black fertility declined, when most resided in predominantly rural, agricultural areas. Engerman (1977) suggests that changes in family life with the end of slavery account for the initial decrease, but Black fertility declined much more sharply between 1880 and 1920, especially in urban populations. Urban Blacks had much lower fertility rates than rural communities, with the South demonstrating the greatest decline (Engerman 1977). Even with the limited census data available for the turn of the century, it is evident that there was a major decline in Black American fertility, with a probable increase in mortality (Zelnik 1969).

The mortality rate for Blacks in 1900 was 30.2 per 1000, twice that of Euro-Americans (Farley 1970). Similar disparities are evident in the infant death rate (275 per 1000) the neonatal death rate (75 per 1000), and the maternal mortality rate (13 per 1000) (Kiple and King 1981). The decrease in fertility and birth led researchers to consider other factors besides economic necessities (Higgs 1977), such as those associated with physiological factors (Tolnay 1986). One such explanation is venereal disease, which is known to increase a woman's chances of having a stillborn (Rose 1985). This accounts for only 30 percent of the decrease in fertility, so other factors must have contributed to the health of the Black population.

Dietary conditions are not eliminated either. Kiple and King (1981) note a post-slave diet consisting of coarse hominy, cornbread, pork fat, coffee, rice, molasses, and occasional vegetables. Most farms did not supply adequate supplies of grains or vegetables since a great majority of the useable land was allocated to other crops. The breakdown of the plantation system led to sharecropping, a system designed to maintain Black families' need to work the fields for landowners (Rose 1989). Another contributing factor to the decrease in diet and nutrition was the 1888 cotton price fall, which put many southern White and Black families in debt to local stores (Rose 1989). These conditions worsened with the spread of the boll weevil in 1905 that wiped out much of the cotton crop throughout the South. With most resources allocated to raising cash crops rather than food, one would expect to find a population with nutritional discrepancies corresponding to these conditions, especially in the rural environment.

The Urban Versus Rural Environment and Health

Research has noted differences between the urban and rural slave populations. Kelley and Angel (1987) highlighted the stresses of slavery through a comparison of 25 sites with a total of 120 Black individuals. They noted that an urban or rural environment directly affected the mortality rate of individuals. For example between 1853 and 1860, rural Virginian slaves were twice as likely to die from dysentery, whereas in the urban setting they were more likely to die from tuberculosis. The pathological conditions noted for the urban slave population in the First/St. Peter's Cemetery in New Orleans, reflect arthritic degenerative joint disease and muscle hypertrophy, but relatively few pathological lesions, such as periostitis, porotic hyperostosis or cribra orbitalia, compared to other sites (Owsley et al. 1987). This is consistent with the physical labor most urban slaves performed. Urban slaves were mostly house servants, but some were skilled craftsmen. However, Rathbun (1987) noted relatively higher frequencies of arthritic changes in a South Carolina rural slave population as would be consistent with farm workers, the role most slaves played.

Free Blacks had a greater propensity for urban areas than their slave counterparts although during the antebellum period, free Blacks in the North and South lived predominantly in rural areas. By 1860, one in three Blacks lived in a city or town (Steckel 2000). The city appealed to free Blacks due to greater fluidity, diversity, tolerance, and job opportunities.

Movement of the Black population increased following the Civil War, but not to a great extent. Most movement was over short distances to cities and towns that had a Freedman's Bureau, jobs, and a social climate of churches and clubs. This totaled a mere 6.7 to 11.8 percent increase in urbanization between 1860 and 1870 (Steckel and Rose 2002). Little changed for post-war Blacks after the initial political advances afforded to them through emancipation and the ability to move into urban areas.

However, urbanization of the Black community in the post-reconstruction time period rose by 132 percent between 1870 and 1910 (Steckel 2000). This migration has strong correlations with the deteriorating socio-economic conditions of the rural South. In 1878 cotton prices plummeted making it difficult for both the White and Black populations. In 1905, the boll weevil swept through much of the South exacerbating an already volatile situation, particularly in rural settings. Cities and towns still had the same rules of exclusion, economic inequality, and access barriers as other localities. In certain areas these conditions were worsened by the influx of European immigrants, who would often be competing for the same employment opportunities as Blacks. This was especially true by the turn of the 20th century, when "Jim Crow" laws were instituted throughout the South virtually segregating the population.

By World War I, the South experienced a major redistribution of the Black population in which there were large migrations into industrial areas doubling the Black population in several of these areas (Steckel 2000). Much of the Black population remained in the rural South until World War I when there was substantial migration to northern cities (Steckel 2000). The "great migration" as it is known responded to a labor force need in combination with diminishing immigration from abroad. Tennessee, like many other southern states, had an overall increase in the Black population until the 1920s, while the percentage of Blacks in the total population decreased. By 1920, Blacks made up 4.3 percent of the population compared to 6.6 percent in 1870 (Steckel 2000). The continual movement of the Black population makes it difficult to understand post-reconstruction Black health in a specific locality, since population redistribution affects the economic, political, and social history of a group.

A recent publication highlights the differences between two late 19th century post-reconstruction cemetery sites representing urban and rural environments. Davidson et al. (2002) compares the health of the Cedar Grove Cemetery, a rural site from southwest Arkansas dating between 1881 and 1927, to the Freedmen's Cemetery, the primary Black cemetery for Dallas, Texas between 1869 and 1907. Both sites are contemporaneous with the Providence Baptist Church Cemetery and are ideal comparative sites to establish expected pathology patterns in rural and urban environments. The Cedar Grove and Freedman's Cemeteries share a similar physical environment and represent a diverse sampling of the Black American population within these regions. As such, they are excellent for comparing the quality of life and economic affects on health (Davidson et al. 2002).

With the growing literature and site reports available, researchers are focusing on other questions beyond slavery and its effects on Black American health to questions on the affects of regionalization, temporal changes, and urbanization. A majority of the skeletal analyses conducted thus far are clearly situated in either a rural or urban environment; whereas the Providence Baptist Church Cemetery may represent a rural non-farming community on the periphery of one of the largest metropolitan areas in the South. The study of the Providence Baptist Church skeletal series will include an intra-population analysis on the health of the population using growth and development, diet, infection, degenerative disorders, and trauma to determine if there are sex and age differences within the population, as well as a comparison to the expected pathology frequencies for the urban and rural environments.

Paleopathological Assessment of Health

Introduction

Paleopathological analyses aid in the assessment of a population's health by allowing for the identification of the skeletal manifestations of specific and non-specific stress indications. Chronic indicators of infection, metabolic disruptions, and degenerative disease must be contextualized with regard to the population under study.

The health of a population is defined by indicators of morbidity, the pattern of mortality, and the archaeological context from which the information is derived. Human bone provides one avenue for assessing the health status of a population since “it is metabolically initiated, nutritionally tempered, physiologically controlled, and biomechanically shaped” (Rankin-Hill 1997: 25). Stress, as expressed in skeletal remains, is a product of environmental constraints, cultural systems, and a host’s resistance (Goodman et al. 1984, Goodman 1993).

Examining multiple stress indicators provides a better understanding of how health is a complement of nutrition, disease, and aspects of life history since stress is any extrinsic variable or combination of variables that cause an organism to react (Buikstra and Cook 1980). Stress, defined as the osseous response to a specific condition, can explain how the skeleton combats infection, metabolic and development disorders, and degenerative disease. One of the major problems with a paleopathological-based analysis is that most leading causes of death cannot be diagnosed, even though chronic conditions affecting morbidity are present (Lovell 2000). For example, Aufderheide et al. (1998) state that less than 10 percent of patients with tuberculosis have skeletal attributes of the disease. The physiological causes of lesions have a complicated relationship with health creating a problem with observation and interpretation (Saunders and Hoppa 1993).

The ability to detect associations between aggregate measures of stress and the risks of illness and death experienced by a past population is fundamental to all analyses and must be addressed in all skeletal investigations. Taphonomic factors preserve only a fraction of the remains for observation so the potential for biased results is inevitable. Wood et al. (1992) present the idea that it is not possible to know if the absence of infectious bony lesions represents people who were not robust enough to resist disease or so frail that they simply died prior to a bony response. This "osteological paradox", as defined by Wood et al. (1992), posits that a skeletal series is a biased sample of all the individuals in a population who were alive at a given age. Not all the individuals who were at risk for a disease at a particular age are represented, nor are all those at risk for disease and dying (Wood et al. 1992). For example, high mortality and low infectious morbidity may suggest an epidemic-type of infection depending on the cultural context (Martin and Goodman 2002). It is important to diagnose lesions based on a descriptive system that accounts for the location of the lesions, the distribution within the individual, and the distribution within the population (Lovell 2000).

The "osteological paradox" can be controlled by the identification and diagnosis of stress in conjunction with information on the archaeological context, the people being examined, and the physical anthropology techniques. Specifically, skeletal analyses involving pathology documentation, supplemental to a basic demographic profile of the population, provide a better understanding of the morbidity and mortality of the population. Dietary, metabolic, and infectious indicators of stress in addition to indicators of trauma can indicate how a population is negotiating their environment. Inter- and intra-site comparisons of stress contextualize this stress in the broader spectrum of health issues.

Infection

Non-specific Periostitis:

Infectious disease, determined through periosteal lesions such as periostitis, indicate physical stress in a population. Periostitis is an inflammatory reaction of the periosteum resulting in new bone formation on the outer cortex (Mann and Murphy 1990, Aufderheide et al. 1998, Roberts and Manchester 1995, Ortner 2002). The periosteum is the outer layer of bone and has the ability to produce new bone through osteogenesis. During osteogenesis, osteoblasts lay down a new protein rich matrix proceeded by ossification of this matrix (Simpson 1985). Infection can trigger this action resulting in periostitis. As such, periostitis acts as an indicator of physiological stress within a population.

Periosteal formations are characterized by pits and striations marking vascularization of the affected area of bone (Simpson 1985, Mann and Murphy 1990). The resulting osseous plaques are characterized by discernible margins and irregular elevations or swellings (Ortner 2002). A periosteal lesion can be a small localized area usually relating to a pathological event at that location or be widespread affecting a majority, if not all, of the bone or several bones suggesting a more pronounced infection or even a systemic infection (Ortner 2002). However, periostitis only involves the superficial periosteum. No cloacae, involucrum, or changes in marrow cavity occur like that which is seen in osteomyelitis (Ortner 2002). In the unhealed state, the area affected can have the appearance of three-dimensional loosely organized, lattice-like layers of sclerotic woven bone (Martin and Goodman 2002). The healed state appears as a dense, smooth, raised, porous area of bone that displays some resorption and reintegration into the cortex (Martin and Goodman 2002). The amount of dead, raised bone gives an idea of the severity and longevity of the infection.

Periostitis is commonly found on the diaphyses of long bones, especially those of the leg since these are more prone to injury (Rose and Hartnady 1988). The tibiae are especially susceptible due to their close proximity to the surface and little encasement in soft tissue (Ortner 2002). Steinbock (1976) suggests the high prevalence of periostitis on the tibia relates to the fairly inactive nature of the diaphysis being conducive to infection, making it a poor indicator of health in isolation. When determining frequency of periostitis, the fibula, which sits deep within the leg, is affected only half as much as the tibia and should be used in conjunction with the tibia because it suggests a much more involved or spreading infection (Rose and Hartnady 1988).

Periostitis can be the product of trauma, adjacent fracturing, or infection. The severity of periostitis is dependent on the type and severity of an injury, duration of a disease, the host's immunity and defensive mechanisms, medical intervention, or the infectious agents involved (Mann and Murphy 1990, Aufderheide et al. 1998, Ortner 2002).The most common forms of periostitis are non-specific varieties with a wide array of micro-organisms acting as causative agents (Ortner 2002). Those lesions relating to trauma are usually small, localized, and non-destructive, while infectious lesions are generalized and often affect multiple bones (Ortner 2002). There are a few periosteal lesions that are associated with specific diseases including tuberculosis and syphilis (Aufderheide et al. 1998).

Diagnosis of periostitis can be used to show the effects of stress on an archaeological population (Larsen 1997). Synergistic processes such as urbanization, migration, and socio-economic status affect the incidence of periostitis (Rankin-Hill 1990). Increases in population size and density contribute to a decrease in health as measured by the prevalence of periosteal lesions (Larsen 1997). Most periosteal lesions described on urban Black skeletal material are the result of localized infections, with a few examples of systemic infection (Rankin-Hill 1997, Davidson et al. 2002). On the other hand, rural Black material has displayed a greater prevalence of systemic infection that could be related to specific pathological conditions (Rose 1985, Rathbun 1987, Rankin-Hill 1997, Davidson et al. 2002).

The locality, prevalence, and severity of periostitis throughout the skeleton can indicate specific infections, such as sinusitis, treponemal infection, and tuberculosis.

Sinusitis:

Sinusitis is a periostitis found within the sinus cavities, especially the maxillary sinus. It is caused by a bacterial infection in the nasal sinuses or from dental abscessing and exhibits itself as irregular pitting and new bone formation on the interior surface of the sinuses. It is most often observed in the maxillary sinus as a plaque-like deposition of new bone with bony spicules. The sinuses, especially those in the facial region tend to fragment in the archaeological context preventing assessment of sinusitis, leading to biased interpretations due to the unavailability of observable material.

Treponemal Infection:

Treponemal infections are caused by the *Treponema pallidum* bacteria. A host of factors affect the rate of treponemal infections including age, diet, exposure, overall health, population density, and other social factors (Ortner 2002). There are four clinically different syndromes: venereal syphilis, endemic syphilis, pinta, and yaws (Ortner 2002).

Treponeme affects elements with minimal overlying soft tissue, since these have a temperature more suitable for bacterial infections (Ortner 2002). This preference creates a pattern of skeletal involvement that when combined with characteristic lesions indicate treponemal infections (Ortner 2002). The diagnosis of specific forms of infection is complicated since not all bones have the characteristic lesions, and the lesions that are present are too similar to make appropriate diagnosis (Steinbock 1976, Ortner 2002). The main difference between the forms is the indigenous locality of occurrence (Ortner 2002).

Endemic syphilis, pinta and yaws are typically transmitted via contact between openings in the skin, while venereal syphilis is through sexual contact. It is the latter on which this review will focus since research suggests a high prevalence of venereal syphilis among the Black community. Syphilis was a great concern to health officials in the late 19th and early 20th centuries (Beardsley 1987). Ortner (2002) indicates that up to 10 percent of the urban population was infected in the United States. It has been suggested that the high infant mortality rate in Black cemeteries, such as Cedar Grove, is the result of a high rate of congenital syphilis, expressed as a high rate of systemic periostitis on diagnostic elements (Rose 1985). Davidson et al. evoke a similar explanation for the high infant mortality rate seen in the Freedman's Cemetery suggesting that the increase in population density and the urban social structure resulted in an increase in transmission among adults (2002). However, another Black cemetery, First African Baptist Church, did not demonstrate any obvious cases of congenital or venereal syphilis (Jacobi et al. 1992). No rural sites, besides Cedar Grove, describe such pervasive systemic infection indicative of treponemal infection.

Venereal syphilis, whether congenital or acquired, has three stages of infection: primary, secondary, and tertiary. The later stages are usually associated with skeletal involvement. Lesions fall into two categories, gummatous and non-gummatous, ranging from localized, elevated plaques of periostitis to encroachment of the medullary cavity and osteomyelitis (Ortner 2002). The skeletal lesions typically affect more than one bone and are bilateral. In 70 percent of cases, the lesions are located on the tibia, nasal cavity, and cranial vault with the long bones being affected ten times more often. Periostitis on the bones of the arm, particularly the ulna and radius, and a worm-eaten appearance of the cranial vault are diagnostic indicators of venereal syphilis (Roberts and Manchester 1995). The skeletal lesions indicating congenital syphilis are quite similar to venereal syphilis having systemic hypervascularization and new osseous growth on the affected bones. These include destructive lesions on the clavicles, lower ribs, multi-focal lesions on the upper arms, and saber tibiae (Ortner 2002). However, congenital syphilis has diagnostic dental defects that when present strongly indicate syphilis, such as Hutchinson incisors and Moon's molars (Jacobi et al. 1992, Becker 1996). For a more thorough description of venereal and congenital syphilis refer to J. L. Becker's master thesis (1996).

Tuberculosis:

Tuberculosis (TB) is an infectious disease caused by the *Mycobacterium tuberculosis* organism. The disease is highly contagious and easily spread through the inhalation of contaminated water droplets. Tuberculosis can be chronic or acute depending on the health and exposure level of an individual. It can also become dormant and re-emerge later in life. The disease can affect nearly every tissue in the body, but normally is isolated to the lungs (Stedman 1982). Diagnosis of acute cases of tuberculosis in the skeleton is nearly impossible, while prolonged or chronic cases are almost as difficult to diagnose. Skeletal involvement of this disease is secondary with the lower thoracic and lumbar vertebrae being the primary affected areas (Steinbock 1976, Ortner 2002). Other areas may include the ribs and sternum. Kelley and Micozzi (1984) suggest that periostitis and plaque-like depositions on the pleural surfaces of the ribs are an indicator of pulmonary tuberculosis; however, other respiratory ailments like pneumonia cannot be excluded. Overall skeletal involvement appears in less than 1 percent of the population (Aufderheide et al. 1998).

Tuberculosis was a leading cause of death among 19th and early 20th century Blacks. Vital statistics between 1900 and 1920 from the US Census Bureau indicate that the third most common cause of death was TB, with tuberculosis of the lung comprising 90 percent of these deaths (Coomer 1920). According to the 1900 census, the most frequent causes of death for Blacks were tuberculosis, pneumonia, nervous disorders, diarrhea, typhoid fever, and malaria (Farley 1970). Tuberculosis was especially prevalent in Blacks with tuberculosis being three times higher in Blacks than Whites (Kiple and King 1981). Also, Torchia (1977) suggests that the high proportions of "consumption" deaths listed in vital records should be attributed to tuberculosis, since Blacks were affected differentially by an acute, but fatal form of tuberculosis.

No vertebral forms of TB were noted in either the Cedar Grove or Freedman's Cemeteries. However, 6 percent of Cedar Grove individuals did display rib lesions suggestive of TB. Additionally, Dallas city records between 1900 and 1907 indicate TB accounted for 25 percent of adult deaths (Davidson et al. 2002). No direct evidence of the disease is present in the Providence Baptist Church series, but at least one individual displayed unusual rib lesions like those described in the Cedar Grove sample. Even though there is no clear evidence of the disease, it cannot be ruled out as a cause of death for many of the individuals.

Roberts and Buikstra (2003) suggest that TB is regarded as a "disease of the poor" directly related to healthy living conditions in which the frequency of TB is impacted by urbanism and industrialization, while climate has less of an effect. In a 1933 study, James Crabtree noted that large, lower-income households had the highest prevalence of tuberculosis in the Kingsport, Tennessee region. He also found that tuberculosis often occurred in conjunction with other contagious diseases, such as influenza and pneumonia, targeting new mothers and the young (Crabtree 1933). The medical field of the period did little to augment the Black condition. Instead, literature reflects the prevailing attitudes towards Blacks as inferior beings that were facing extinction. In the 1903 article "Tuberculosis in the Negro," Seale attributes the higher prevalence of the disease to the inferiority of the "race" and their poor sanitation and hygiene. Until the early 20th century most white doctors believed, as had their antebellum counterparts, that Blacks were biologically inferior and subject to a different pathology than Whites. They regarded

Blacks as psychologically unfit for freedom and for the most part uneducable in the ways of better hygiene. “Many White doctors thought it futile even to try to rescue Black health” (Beardsley 1987: 12). As a result, health articles and journal submissions were often clouded by these biases making it difficult to ascertain an accurate depiction of tuberculosis in relation to the overall health of the Black population.

Metabolic Stress

Enamel Hypoplasias:

Enamel hypoplasias are non-specific indicators of childhood stress (Goodman and Armelogos 1985) resulting from deficiencies in enamel thickness due to a cessation of ameloblast activity. Enamel formation starts at the incisal crown and proceeds to the cemento-enamel junction through a process called amelogenesis. Amelogenesis involves ameloblasts, a thin layer of cells on the inner layer of the enamel organ that secretes a proteinous matrix. (Avery 2000). This matrix incrementally mineralizes forming layers called striae of retzius, which reflect week intervals, to become 97-98 percent hydroxyapitate crystals. Amelogenesis is sensitive to even minor metabolic stress causing a disruption of the layering of the crystals, and sometimes resulting in the appearance of a macroscopic alteration (a hypoplasias).

Metabolic stresses caused by nutritional deficiencies or disease can interrupt the incremental deposition of enamel, creating hypoplasias on tooth surfaces. Hypoplasias manifest as pits/furrows to large grooves with most being horizontal, linear defects. Hypoplasias are quantifiable defects that are measured by the thickness of the enamel at the site of the defect as well as its distance from the cemento-enamel junction (Goodman and Rose 1990). These measurements provide an estimated age at which the insult occurred, and often correspond to other indicators of stress. The width of the hypoplasias can also indicate the duration of the stress (Blakely and Armelagos 1985).

Goodman and Rose (1991) identify three potential causes of hypoplasias: hereditary abnormalities, localized trauma, or systemic metabolic stress. For a review of clinical and epidemiological evidence for enamel hypoplasias refer to Hillson (1996). Generally, the consensus is that the occurrence of hypoplasias peaks between the ages of two and four and may be related to weaning and the transition to an adult diet (Goodman et al. 1980, Corruccini et al. 1985). Others believe that metabolic stresses, which affect calcium availability, can result in enamel defects (Blakely and Armelagos 1985).

An association between the prevalence of enamel hypoplasias and the general living conditions of a population has been identified by Martin and Goodman (2002). For example, Zhou's (1995) dissertation research analyzing the famine of 1959-1961 in the People's Republic of China identified differences between the rural and urban populations. Rural individuals had more defects than urban ones suggesting that the rural individuals were experiencing more stress.

Porotic Hyperostosis:

Porotic hyperostosis is found world wide in both industrial and non-industrial societies as a non-specific indicator of metabolic health. More specifically, it is often used as an indicator of nutritional health (Martin and Goodman 2002). A combination of cultural, ecological, and biological factors contributes to the development and appearance of porotic hyperostosis in an individual (Mensforth et al. 1978, Palkovich 1978, Huss-Ashmore et al. 1982). Additionally, Larsen (1997) suggests a shift in diet, sedentism, and poor sanitation affect the prevalence of porotic hyperostosis.

Porotic hyperostosis is primarily found in children, adolescents, and women of childbearing years (Mensforth et al. 1978). The actual physical manifestation usually is symmetrical involving the frontal, parietal, and occipital bones. It is distinguished by a sieve-like appearance of the cranial vault with a thickening of the diploe. One of the diagnostic features of the disorder is a “hair-on-end” appearance of the diploe radiographically in which the expansion of the diploe creates a perpendicular orientation of the trabeculae (Steinbock 1976, Huss-Ashmore et al. 1982, Goodman et al. 1984, Stuart-Macadam 1987a).

Studies of New World populations demonstrate dietary-related iron deficiencies are the most likely underlying condition causing porotic hyperostosis (Steinbock 1976, El-Najjar et al. 1978, Goodman et al. 1984). Rose (1985) suggests that diet directly impacts frequency of porotic hyperostosis citing the rural Black diet is seasonally impacted by a heavy reliance on hominy and corn. However, the dietary basis for porotic hyperostosis is complicated by the rise in genetic disorders, which also produce anemias, brought to the New World through colonization and the African Diaspora. This is especially true for Blacks, who express a heterozygous trait providing them with a natural immunity to malaria at the same time making them more susceptible to sickle-cell anemia and its ill effects (Gibbs et al. 1980). More research needs to be conducted to evaluate the effect of iron level and its relationship to anemia (Larsen 1997).

Porotic hyperostosis is inherited or acquired. Observation of all skeletal elements is required to discriminate between the two varieties. Hereditary cases are usually associated with significant skeletal responses. For example, Rankin-Hill (1997: 159) notes that "congenital hemolytic etiologies" such as sickle-cell, elicits anemic-like conditions, but sickle-cell anemia also elicits responses in several bones in the form of periosteal lesions (Martin and Goodman 2002), cortical thickening, medullary narrowing, necrosis of epiphyses, and vertebral compression of the centrum (Steinbock 1976). Acquired porotic hyperostosis is relatively minor and is often isolated to specific cranial elements (Martin and Goodman 2002). This source of anemia directly relates to the health status of a population because it can be caused by weaning stress, infectious and parasitic diseases, or maternal disadvantages (Mensforth et al. 1978, Lallo et al. 1977, Palkovich 1987). Larsen (1997) provides a lengthy discussion on the probable etiology of porotic hyperostosis throughout the world suggesting that porotic hyperostosis is the result of highly localized factors. Other conditions can mimic skeletal changes caused by anemia, such as rickets and infection. Regardless of the etiology, an anemic response creates porosity of the cranial vault.

Ectocranial porosity should not be confused with porotic hyperostosis, but it does have an anemia-based etiology like porotic hyperostosis. Ectocranial porosity is recognized as an "orange peel" appearance of the cranial vault bones without the bone thickening seen in porotic hyperostosis (Owsley et al. 1990).

Cribra Orbitalia:

Cribra orbitalia is typically considered porotic hyperostosis of the orbital plate. It appears as small (0.5 mm) to large (2.0 mm) sieve-like holes on the outer table of the diploe (Angel 1966, Stuart-Macadam 1985, 1988). This pitting is often associated with a thickening of the diploe, especially in more pronounced cases.

Diagnosis of cribra orbitalia is fairly straightforward, while discerning its etiology is more controversial. Clinical and paleopathological studies indicate a common etiology for both porotic hyperostosis and cribra orbitalia (Stuart-Macadam 1987b). The main theory for cribra orbitalia's origin is iron deficiency, but it may also be caused by malnutrition, scurvy, epidemic disease, and sickle-cell anemia (Stuart-Macadam 1985, Mann and Murphy 1990).

Cribra orbitalia usually develops in young children as a result of childhood stresses. It can be present in older juveniles and adults, but unhealed lesions are usually found in young children under the age of five (Lallo et al. 1977, Mensforth et al. 1978). Hence, cribra orbitalia is rare in the adult context with most expressions of the disorder being in the healed state and representing an earlier childhood stress. When present in an adult it tends to be associated with porotic hyperostosis of the cranial vault.

Degenerative Disorders

Biomechanical stress can ultimately impact the overall health of an individual by adversely affecting mobility and economic productivity. There are a variety of degenerative disorders, including osteoarthritis, enthesophytes, and Schmorl's depressions that can be attributed to physiological or activity-induced conditions.

Degenerative Joint Disease/Osteoarthritis:

Degenerative joint disease or osteoarthritis is the one of the most common conditions found in the human skeleton, especially in the archaeological context. It is a chronic inflammatory disease frequently resulting in the destruction of hyaline cartilage-covered joints (Mann and Murphy 1990). The vertebrae, hips, and knees are the most prevalent weight bearing joints affected (Roberts and Manchester 1995). Osteoarthritic lipping of the vertebrae is referred to as osteophytosis and will be discussed in a separate section. Both osteoarthritis and osteophytosis are highly correlated to advancement in age. Other joints, commonly affected through chronic use and trauma, are the shoulder, elbow, and temporomandibular joints (Roberts and Manchester 1995). However, it is rare to find an isolated case of osteoarthritis in just one joint.

Osteoarthritis is the result of an imbalance between the mechanical stress in the joint tissue and the ability of the joint tissue to withstand stress. Degenerative joint disease follows a progression of cartilage breakdown, reduced bone vascularization, inability for repair, decreased lubricating fluid, and eventual exposure to subchrondral bone, which results in the articular surfaces becoming pitted, eroded, and lipped around the margins (Merbs 1983). Identification of osteoarthritis is based on the presence of osteophytes (osseous projections), porosity, and eburnation of joint surfaces. These identification criteria were originally outlined by Ortner (1968). Lipping is new bone growth projecting within and/or around the joint capsule. Marginal lipping/osteophytes develop in relation to mechanical forces and the joint contour (Merbs 1983). Porosity is the deterioration of the joint surface usually in response to loss of lubricating fluid and exposure of adjacent osseous surfaces. Eburnation results when there is prolonged exposure of adjacent surfaces producing a polished appearance of the surface (Steinbock 1976, Ortner 2002). Continual wear of an eburnated surface can produce roughening, grooving, or gross deformity of the joint (Ortner 2002).

Several factors influence an individual's chances to experience degenerative joint disease. Metabolism, nutrition, bone density, infection, trauma, and genetics all affect expression of osteoarthritis (Ortner 2002) Two main pathways predisposing an individual are systemic factors (i.e., age, sex, nutrition, and bone density), and mechanical-functional factors (i.e., trauma, chronic activities, and obesity) (Jurmain 1975).

Degenerative joint disease occurs in populations world-wide, but differences exist between populations. Jurmain (1975) was one of the earliest researchers to note a difference between Black and European susceptibility. Jordan et al. (1995) demonstrated a higher prevalence of osteoarthritis in the hip and knee in a study of a North Carolina rural population in comparison with urban environments. These population differences are linked to activity patterns that habitually place strain on joint systems. For example, distinct differences in patterning and severity can be linked to different occupations such as laborer and non-laborer (Jurmain 1975). Dekker et al. (1992) assert that in urbanized, industrial societies, osteoarthritis is rare prior to the age of thirty. However, urban Blacks held predominantly unskilled laborer positions throughout the post-reconstruction time period. These positions were not moderated and required intensive and repetitive actions, which drastically impacted the skeleton. Davidson et al. (2002) were able to demonstrate that the urban Dallas population had higher frequencies of osteoarthritis in certain joints than their rural counterparts. They suggested, that in the rural setting, the seasonality of work and the ability to moderate tasks decreased osteoarthritis frequencies.

Biomechanical, gross changes are concomitant with age. Steinbock (1976) notes most individuals above the age of 30 display some degree of osteoarthritis. Traumatic events causing the onset of degenerative joint disease "may produce pathology, or premature aging in the parts of the articular system under greatest stress" (Merbs 1983: 19). Particular activities, like sports and occupation, requiring concentrated stress on a specific locality, induce osteoarthritic development at the stressed joint. For example, it would be expected to find more extensive osteoarthritis on the cervical vertebrae and hands of a cotton worker (Merbs 1983).

Class, sex, pattern of distribution, and severity of degenerative joint disease in a population help explain the quality of life of that population. These provide a basis for analyses to shed light on the occupational stresses experienced by and the reaction to traumatic events within a population.

Osteophytosis:

Osteophytosis is osteoarthritis in the vertebral column. It is usually distinguished from the typical osteoarthritic changes seen in the long bones because of the type of joint it is. Osteophytosis results in a thinning of the intervertebral discs. These discs are comprised of a nucleus pulposus surrounded by an annulus fibrosus. The nucleus pulposus is the inner semi-gelatinous part of the disc and becomes more collagenous with age. It acts to equalize pressure, is involved in fluid exchange, and is an axis for movement (Merbs 1983). The annulus fibrosus is the outer layer composed of fibrous tissue and is a major stabilizing force. Degeneration of the annulus fibrosus results in protrusions of the nucleus pulposus. This creates extra pressure, which initiates new bone growth (Merbs 1983). Similar to osteoarthritis, it manifests itself as osseous spicules and projections on and around the margins of the centrum. A continuation of this bony formation can result in ankylosis of the vertebrae, severely limiting movement within the vertebral column (Roberts and Manchester 1995).

Enthesophytosis:

Enthesophytosis is the result of inflammation at muscle, tendon, or ligament attachment sites and the pursuant ossification of these tissues (Mann and Murphy 1990). Enthesophytes usually appear as spike-like projections, spurs, or irregularities at an attachment site. Common areas affected include the iliac crest, the trochanteric fossa, calcaneus, and proximal ulnae (Ortner 2002). The expression of enthesophytosis indicates repetitive physical activity that has placed chronic strain and inflammation on the tendon or ligament (Mann and Murphy 1990). Like other degenerative disorders it is correlated with activity patterns and occupation. Owsley et al. (1987) describe individuals with enthesophytes as having high levels of physical activity.

Schmorl's Depressions:

Schmorl's depressions indicate strain on the vertebral column. They are typically located in the lower thoracic and lumbar vertebrae as irregular, rounded nodules up to 1 cm wide (Ortner 2002). Cartilageous nodes develop when the tension of weight bearing causes intervertebral discs to penetrate into the bony trabeculae of the adjacent vertebral centra (Ortner 2002). The depressions represent the site of the pressure exerted onto the centrum. Several researchers note that the Schmorl's depression is the product of a herniated disc (Merbs 1989, Schmorl and Junghanns 1971). Schmorl and Junghanns (1971) noted a disruption of annulus fibrosus bundles on the marginal epiphyses followed by a protrusion of the disc material into the surrounding centra when comparing over 4000 autopsied specimens. The prevalence of Schmorl's depressions indicates the amount of stress placed on the vertebral column.

Diffuse Idiopathic Skeletal Hypertrophy:

Diffuse Idiopathic Skeletal Hypertrophy (DISH) is a specific degenerative disease that greatly impacts an individual's mobility. It is more common in males than females with increased prevalence with age (Ortner 2002). It is clinically diagnosed via the radiographic determination of at least four vertebrae being fused together. DISH is also characterized by excessive bone hypertrophy around several joint surfaces without clear joint destruction (Ortner 2002). It is often found in isolation, but can be found in combination with other degenerative diseases. The presence of other pathological conditions often complicates the diagnosis of DISH.

Trauma

Skeletal indicators of trauma are the result of various cultural activities including interpersonal violence, activity related accidents, interaction with environmental hazards, or suicide (Steinbock 1975). Skeletal trauma suggests the quality of life for a population by having socioeconomic and political ramifications, such as an individual's ability to work or the stability of the population as a whole. There are several types of trauma. Trauma can manifest itself as fractures, dislocations, and deformation of the bone (Ortner 2002). As a culturally derived entity, trauma also includes weapon wounds and surgical procedures. Fractures are the most common form of trauma and are the easiest to categorize. Galloway (1999) provides an excellent review of the various fractures and fracture patterns along with the physiological stressors causing them. Differences in fractures by sex can indicate variation in gender roles and occupations (Davidson et al. 2002). For example, Davidson et al. (2002) indicate the high incidence and specific location of arm fractures in females and leg fractures in males from Cedar Grove are expected for a rural population because of the susceptibility to accidents and limited access to healthcare in the rural environment. Further investigations into fracture patterns between the rural and urban environments need to be conducted, especially in regards to occupation.

Stature

Anthropometric analyses, such as those involving stature, permit comparisons between populations and comparisons to established standards. Adult stature is a reflection of the conditions during childhood development given the pre-existing socio-economic and epidemiological environments (Komlos and Baur 2004). This makes it one of several non-specific indicators of stress. When information is available, adult stature can act as a link between analysis and changes in nutrition and health over time (Costa and Steckel 1997, Steckel and Floud 1997). Eliminating extraneous factors, stature should increase positively with good times and decrease under weak economic conditions.

There is a strong relationship between growth suppression in childhood and adult body size (Floud et al. 1990, Komlos 1992, Steckel 1995). Using several populations from around the world, including North America, Europe, and Asia, Steckel (1995) demonstrated that adult stature can be explained largely by environmental factors. In fact "the ultimate size and shape that a child attains as an adult is the result of a continuous interaction between genetic and environmental influences during the whole period of growth" (Eveleth and Tanner, 1990: 176).

Temporal variations in stature have a strong relationship with economic and nutritional improvement (Meadows Jantz 1996) and decline during times of hardship and deprivation. Meadows Jantz (1996) provides a review of the secular change literature noting differences in ancestry, individuals, and geographic regions. Komlos and Baur (2004) note urban versus rural differences, in which an urban environment would have a better supply of medical services than would the rural, leading to a healthier population.

It has been suggested that throughout the 19th century an overall increase in health occurred. However, after the Civil War and during reconstruction, health decreased for the entire population with marginal groups affected to a greater extent. This is supported by the stature research of Steckel and Floud (1997), showing that by using stature as a proxy for health, the latter half of the 19th century witnessed an overall decline in stature. Fogel (1986) and Meadows and Jantz (1995) showed a decrease in the increasing secular change that was well established for developed nations since the early 19th century.

Particularly, Meadows Jantz (1996) noted a slight decrease in the height of Black females with a birth year around 1900, suggesting that this was a stressful time for this population. However, a secular increase of 9 cm for Black females and 13 cm for Black males can be seen over the 220 years for which the study spanned (Meadows Jantz 1996). Overall, the secular changes in size reflect improved health in the 19th and 20th century, but also a trend suggesting specific periods of stress that adversely affected stature. The study of human growth and development makes clear that diet, disease, and work are not isolated, but determine the net nutritional status. Growth retardation and illness tend to occur together as a result.

Conclusion

A skeleton can be examined for evidence of pathology, trauma, and stature providing opportunities from which researchers can gain a better understanding of the health and mortality of late 19th century Blacks. A growing number of anthropologists incorporate skeletal biological analyses in site reports and publications of archaeological sites. It is these biological analyses that allow the testing of hypotheses and inferences about diet, nutrition, health, disease, demography, and behavior, with regard to previously published literature that make generalizations based on inadequate data (Huss-Ashmore et al. 1982).

Afro-American Biohistory: Comparative sites

Historical literature is replete with information and theorized accounts on the Black Diaspora. These data have only recently been scrutinized by the objective evaluation of the growing archaeological and osteological data available for analysis. Black series are becoming available through urban renewal, cemetery re-allocation, civil engineering projects, and accidental discoveries (Owsley et al. 1990). Blakely and Beck (1982) note as more and more cemeteries are uncovered as the result of urban expansion and land re-allocation, a coordinated effort to examine the skeletal remains of these cemeteries must be established. This area of research has generated and is generating a plethora of research in which skeletal biology is able to target and address several controversial hypotheses regarding Black health.

In recent years a growing number of Black skeletal series, dating from the 18th to the early 20th centuries, have been studied and represent an array of Black life styles and biohistory. These biological series include plantation slaves (Corruccini et al. 1985, Rathbun 1987), industrial slaves (Angel and Kelley 1983, Kelley and Angel 1983, Angel et al. 1987), urban slaves (Owsley et al. 1987, Owsley et al. 1990), antebellum urban free Blacks (Crist et al. 1997, Rankin-Hill 1997), reconstruction and post-reconstruction rural Blacks (Rose 1985, Shogren et al. 1989, Dockall et al. 1996), and reconstruction and post-reconstruction urban Blacks (Beck 1980, Blakely and Beck 1982, Hazel 2000, Crist and Washburn 2000, Tine 2000, Davidson et al. 2002).

The amount of research conducted, data collected, and comparisons made have been limited because of time constraints on the analyses permitted, the preservation of remains, methodologies applied, and the publication of data. However, three trends have been noted: 1) high infant and child mortality rates; 2) periods of malnutrition and diseases evidenced by the linear enamel hypoplasias and non-specific infectious lesions; and 3) high degenerative joint disease and muscle attachment hypertrophy (Rankin-Hill 1997). The following section highlights and briefly describes the skeletal biological assessment of health on several historic Black sites, two of which, Freedman's Cemetery and Cedar Grove Cemetery, will be discussed further for comparison in this investigation.

38Ch778 (1840-1870)

A small plantation slave cemetery population containing 36 individuals was unearthed during a cemetery relocation project outside Charleston, South Carolina (Rathbun 1987). This population consisted of 28 adults (13 males and 15 females) and 8 sub-adults. Mortality data indicated a relatively young age at death, demonstrating a sex difference. Males had a lower age at death at 35 years than females at 40 years, suggesting a greater risk of early mortality. Both children and adults demonstrated high rates of periosteal, infectious lesions (64.3 percent), and heavy biomechanical stresses expressed as degenerative joint disease, especially in males (Rathbun 1987). High rates of childhood metabolic stress in the form of enamel hypoplasias were prevalent, where 92 percent of males and 70 percent of females exhibited this feature. Anemia related disorders, such as porotic hypostosis and cribra orbitalia were also prominent with an 80 percent prevalence rate in the children (Rathbun 1987). In particular, the children demonstrated evidence of enamel hypoplasias, cribra orbitalia, and delayed developmental growth (Rathbun 1987).

Albert J. Phillips Memorial Cemetery (41Gv125) (1885-1927)

Albert J. Phillips Cemetery, located in Texas City, Galveston County, Texas, is known to have served the Black population from the area. A total of 53 graves with 43 burials, 35 adults (11 male, 12 female, and 12 indeterminate), 3 children, and 5 indeterminate, were unearthed during improvements to State Highway 3 (Dockall et al. 1996). Analysis was limited to few burials because of poor preservation and other taphonomic factors. The cemetery population had a disproportionate number of adults versus sub-adults with only 3 individuals identified as sub-adults, a much lower number than would be expected in a typical cemetery mortality profile. A higher prevalence of porotic hyperostosis, but not cribra orbitalia, was noted when compared to similar cemeteries. Periostitis was relatively low with lesions predominantly restricted to the lower leg, which is comparable to other sites with the exception of Cedar Grove. Degenerative joint disease was prevalent suggesting a strenuous lifestyle. Trauma, in the form of fractures and sharp force injury, was relatively low. Also, adult stature estimations suggest a much shorter population than other Black populations. The small sample sizes prevented more quantitative analyses, but do suggest a population with relatively poor health. (Dockall et al. 1996).

Catoctin Furnace (1790-1820)

A small industrial slave cemetery in Frederick County, Maryland contained 36 individuals from 35 graves of which a detailed analysis was conducted on 31 individuals, 16 adults and 15 children (Angel and Kelley 1983, Kelley and Angel 1983). A third of the cemetery was in the way of highway construction necessitating the removal of this area. A higher age at death for males (41.7 years) than females (35.2 years) was noted suggesting a sex differential in health that could be related to differential treatment based on skills. Overall, there was a low rate of infection with few periosteal lesions noted, a low rate of nutritional disorders, such as enamel hypoplasias or a decrease in adult stature compared to the contemporary population as a whole, and high physical stress relating to the Iron Forge occupational activities of these slaves (Kelley and Angel 1983, 1987). Also, the population demonstrated a relatively high percentage of possible rickets, a vitamin D deficiency disorder (Kelley and Angel 1983, 1987).

Cedar Grove Cemetery (3LA97) (1890-1927)

Cedar Grove Baptist Church Cemetery was excavated during revetment activities on the Red River in rural LaFayette County, Arkansas. The skeletal population represents emancipated slaves, sharecroppers, and their descendents and is comprised of 80 individuals; 36 adults (15 males and 21 females) and 44 sub-adults. The population is one of the only post-reconstruction Black sites representing a highly stressed population in which 90 percent of individuals had some form of periosteal lesion with several (41.2 percent) having systemic infections, especially the sub-adults. Also, most individuals displayed evidence of metabolic disorders often associated with diet, such as anemia and rickets (Rose 1985). Active cribra orbitalia was documented in 58.5 percent of the population. Additionally, a high frequency of degenerative joint disease suggests strenuous physical activity (Rose 1985). Overall, the population suffered from high rates of infant mortality, infection, nutritional disorders, and arthritic conditions, but had high mean statures (Rose 1985, Boudreaux 1999).

Cypress Grove Cemetery (16Or108) (1849-1929)

The Charity Hospital/Cypress Grove Cemetery was excavated during a road construction project in New Orleans, Louisiana (Owsley et al. 1990) The cemetery population consisted of 271 burials; 264 adults (138 males, 107 females, and 19 indeterminate) and 7 sub-adults (Owsley et al. 1990). Ancestry estimation could be completed for only 61 individuals of whom 44 were designated as Black, and of which most were male. A high frequency of pathological conditions was noted, including severe bone inflammations in the form of periostitis and osteomyletis. Also, degenerative joint disease among black males was marked when compared to females. The females had relatively unremarkable features unlike comparative colonial samples indicating the possibility of less physical strain. High rates of trauma, both healed and unhealed, were present. Widespread cut marks indicative of autopsy, experimentation, and surgery were also notable (Owsley et al. 1990).

Elko Switch Cemetery (1Ma305) (1850-1920)

A small, unmarked, unidentified cemetery located in Madison County, Alabama was discovered in 1965 when construction started on Rideout Road (Shogren et al. 1989). The highway was shifted to prevent further intrusion on the unidentified cemetery, but in 1987 new highway construction necessitated the removal and reinterment of the burials. Excavation and analysis resulted in 34 individuals from 56 graves composed of 27 adults (9 definite male, 13 definite female, and 5 unknown) and 7 children (Shogren et al. 1989). High infant mortality was noted with 41 percent of deaths represented by children under the age of 5 (Shogren et al. 1989). Preservation severely limited assessment of infection and trauma beyond that which could be derived from teeth. Over one-third of adults exhibited at least one linear enamel hypoplasia. Elements present suggest a healthy population in terms of few infectious lesions, such as periostitis, and few examples of systemic infection, osteoarthritis, and trauma. However, at least 3 individuals suggested a systemic form of infection either tuberculosis or treponemal in origin. Several individuals demonstrated mild degenerative joint disease or other osteoarthritic conditions. At least 4 individuals demonstrated antemortem, perimortem, and postmortem trauma in the form of healed and unhealed fractures, and an autopsy incision (Shogren et al. 1989).

First African Baptist Church (FABC) 10th Street Cemetery (1810-1822)

Eighty-nine individuals representing members of the original “acknowledged” First African Baptist Church were recovered in 1983, during highway construction in Philadelphia, Pennsylvania. The demographic profile of the population included 56 adults, 18 males and 38 females, and 33 children. Twenty-nine individuals, 32.6 percent of the population, were under the age of five indicating high infant mortality and nutritional stress (Crist et al. 1997). The average age at death was 39.5 years with males having a slightly higher age at death (45.9 years) than females (39.5), and 9 individuals being over 60 years of age (Crist et al. 1997). Few analyses have been conducted on the skeletal evidence of stress in this population, so it cannot be discussed. However, trauma, in the form of fractures, was exhibited in 10 adults and 1 adolescent (Crist et al. 1997). All but one of these fractures was healed. The patterning of these suggests more interpersonal violence than that which was exhibited in a later, splinter congregation interred at the 8th Street FABC cemetery. The overall health of the congregation suggests similarities to an urban slave condition.

First African Baptist Church (FABC) 8th Street Cemetery (1823-1843)

Accidental discovery of the 8th Street First African Baptist Church occurred during the excavation of the Philadelphia Commuter Rail tunnel in Center City Philadelphia (Parrington and Roberts 1984). This "incorporated" FABC, consisted of 135 individuals; 75 adults (36 males and 39 females) and 60 children, representing the members of a splinter congregation of the original "incorporated" FABC (Crist et al. 1997). Differential preservation limited the sample sizes, especially sub-adults where only 28 were available for analysis (Crist et al. 1997, Rankin-Hill 1997). High rates of metabolic deficiencies, especially anemia-related conditions, were visible in both adults and sub-adults. Close to 50 percent of all adults demonstrated some form of porotic hyperostosis. Infectious disease indicators affected 25 percent of the adult population with tuberculosis accounting for 4 percent of these (Rankin-Hill 1997). Trauma was relatively inconsequential with only 4 individuals displaying trauma suggestive of violence while most trauma was healed suggestive of an activity induced event. Seventy-five percent of all adults demonstrated at least a mild expression of osteoarthritis with little sex difference in prevalence and usually several joints affected simultaneously. The overall mortality profile of this cemetery suggests a reduced risk of death compared to other Black samples. The mean age at death for females was 38.9 years and 44.8 years for males. The First African Baptist Church at 8th Street represents a relatively healthy skeletal population compared to similar skeletal populations.

Freedman's Cemetery (41DL316) (1869-1907)

Surveying for expansion of the North Central Expressway in downtown Dallas, Texas resulted in the identification of the Freedman's Cemetery. Further research and excavation of the proposed highway expansion area unearthed 25 percent of the cemetery consisting of 1150 burials, containing 1157 individuals (Condon et al. 1998). Freedman's Cemetery was the only public grounds for Dallas Blacks and as such represents people from all sectors of society. The Freedman's Cemetery demonstrates a death pattern consistent with its time period of use where there was a high rate of infant mortality, relatively low adolescent death, a peak at middle age and then gradually decreasing as fewer individuals were alive. The mean age at death for adults was 42.6 years with few individuals aged above 50 suggesting a slightly shorter lifespan than comparative groups

(Tine 2000). Also, little evidence of metabolic stresses, such as anemia, was present in the form of porotic hyperostosis (5.7 percent) or cribra orbitalia (2.6 percent) with females demonstrating slightly higher rates. The population demonstrated a relatively high rate of infection, mostly non-specific periosteal infections. Children displayed the highest rates of active lesions (63.8 percent of observable individuals), whereas adults displayed more healed lesions. At least one linear enamel hypoplasia was identified in 68.5 percent of observable individuals, while 49.3 percent of individuals had more than one. Degenerative joint disease was prevalent, but usually in a mild form. The lower limb, specifically the knee, was affected with females exhibiting more arthritic changes in the upper limbs. Trauma was visible in 30.8 percent of individuals. Males were affected twice as often as females with bone fractures being the most common form of traumatic event, particularly in the lower limb (Tine 2000, Davidson et al. 2002). Davidson et al. (2002) have been able to differentiate three distinct temporal sequences to the cemetery and have been able to demonstrate differences in enamel hypoplasias, infectious lesions, degenerative joint disease, and trauma frequencies through diachronic skeletal biology analyses. Interesting to note is that the Late Period, 1900-1907, demonstrated the highest levels of infection, degenerative joint disease, porotic hyperostosis, and cribra orbitalia (Davidson et al. 2002).

Mother United African Methodist Episcopal (UAME) Church Cemetery (7NCE-132) (1850s-1920)

A population of 347 individuals comprised of former slaves, freeborn Blacks, and their descendents were buried in the Mother UAME Church Cemetery, located in

Wilmington, Delaware (Hazel 2000). New urban construction required the movement of the cemetery and was completed in coordination with the current UAME church of Wilmington. A thorough, detailed analysis was completed on 164 of the best preserved individuals; 128 adults (60 males, 43 females, and 25 indeterminate) and 36 sub-adults. The paleopathological analysis using Smithsonian Institute Coding System, was completed at the request of the investigators and with permission from the church leaders (Crist and Washburn 2000). Little evidence of childhood stress was indicated through relatively low rates of anemia, expressed as porotic hyperostosis or cribra orbitalia, and with only 19.4 percent of sub-adults and 9.3 percent of adults displaying enamel defects. However, one child demonstrated evidence of rickets. Eighteen percent of observable adults and 11 percent of sub-adults displayed some form of periostitis with the tibia and femur being the primary affected areas (Crist and Washburn 2000). Degenerative joint disease, in the form of enthesophytes, was uncommon and predominantly found on the femora and ulnae. Mild osteoarthritis indicating biomechanical stress was relatively common, especially in the hip and knee, corresponding to the high age at death of the adults (Crist and Washburn 2000).

Newton Cemetery, Barbados (1660-1820)

The Newton Sugar Plantation Cemetery in Barbados consists of 101 individuals. All individuals were indicated as being of African origin or African descent making it one of the earliest and largest slave skeletal series. However, preservation was poor limiting the scope of analysis to primarily cranial and dental analyses (Corruccini et al. 1982). Only 50 percent of the material could be sexed, but remained undifferentiated for analyses, which produced a mean age of death of 29.3 years (Corruccini et al. 1982). There was a differential in the skeletal age represented since few children, especially infants, were represented. Available data did show a high infant and child mortality with few individuals living beyond 40 years of age, which corresponds to the plantation's historical records (Handler and Lange 1978). Skeletal evidence for development disruption was apparent. No cranial porosity was noted, but several examples of growth disruption were seen in the teeth. Corruccini et al. (1985) note a nonrandom, high frequency, and atypical severity of enamel hypoplasias suggesting extreme episodes of early metabolic stress. Jacobi et al. (1992) conducted further analyses on the dental material describing diagnostic features of congenital syphilis, specifically in children. Unfortunately, the preservation of material precluded any further detailed analyses on the skeletal material.

Oakland Cemetery (1866-1927)

Unmarked graves in the Oakland Cemetery in Atlanta, Georgia were discovered during archaeological surveying for future development opportunities. Fourteen individuals; 9 adults (4 males and 5 females) and 5 sub-adults, were identified. Comprehensive analyses could be completed for only 4 individuals due to poor preservation (Beck 1980 and Blakely and Beck 1982). Cranial morphology of the 4 analyzed indicated an African ancestry suggesting that this section of the cemetery may have been a segregated part of the larger communal "Atlanta" cemetery. Little demographic information is attainable, but all individuals demonstrated some form of pathology. At least one displayed characteristics of anemia, two demonstrated severe trauma and subsequent infection, and three had evidence of degenerative joint disease (Beck 1980). The little information available suggests that these individuals lived a strenuous life and may have been exposed to potentially harmful contagions, which is consistent with the historical record of Atlanta's poor black population.

St. Peter's Street Cemetery (New Orleans First Cemetery) (1720-1810)

St. Peter's Cemetery, located in the New Orlean's French Quarter, served as New Orlean's principle cemetery and represents one of the earliest urban Black skeletal populations. Thirty-two burials with 29 individuals; 26 adults (14 males and 12 females) and 3 children, constitute the population. Of these, 13 were identified as Black (Owsley et al. 1987). These 13 individuals most likely represented an urban slave population. There was a sex differential in mortality in which the mortality of females peaked earlier at 20-24 years while males peaked at 40-49 years, but the sample size cautions against further conclusions (Owsley et al. 1987). Poor preservation precluded investigations on the sub-adult population. The sample, especially males, demonstrated frequent muscle hypertrophy and osteoarthritic changes indicating a strenuous lifestyle. Little evidence for skeletal infection, in the form of periostitis, was evident. Owsley et al. (1987) noted reduced frequencies of physical stress markers and metabolic disease, such as porotic hyperostosis, when compared to rural slave populations. However, defensive fractures were noted, particularly of the ulna indicating possible interpersonal violence. Overall, "the evidence presented suggests that slaves buried in this cemetery may have lived better lives than those on the rural plantations" (Owsley et al. 1987:24).

Biohistory Conclusion

Life for Black Americans varied temporally, geographically, and regionally. Skeletal indicators of stress decreased over time and situation. It has been noted that health in the United States was improving by the end of the 19th and early 20th centuries with the emergence of antibiotics, new equipment sterilization techniques, and much better living conditions. This improvement in health was not achieved by all populations, especially those in the rural conditions. One major difference was found in the rates of sub-adult stress. The North urban and free Black populations all witnessed a decrease in frequency of linear enamel hypoplasias and porotic hyperostosis. Periostitis frequencies had a similar variation. Degenerative disorders were frequent in all populations and directly related to occupation and other biomechanical stress.

The previous research examining Black health emphasizes the need for comprehensive studies to establish trends regarding the affect socio-political roles, locality, and economy have on Black health. One area, previously inaccessible in research, is the urban-rural dichotomy and is the focus of this analysis.

Chapter 4
Materials and Methods

Three sites were utilized for comparison in this thesis offering a sample size of 1026 individuals; 884 from the Late Period Freedman's Cemetery (41Dl316), 80 from Cedar Grove Cemetery (3La97), and 62 from Providence Baptist Church Cemetery (40Sy619). Specific sample sizes vary between analyses due to differential bone preservation. Demographic composition for Providence Cemetery can be found in Table 3. Summary demographic data for all three cemeteries can be found in Table 4.

Detailed demographic analyses between sites were not completed for this analysis; rather, the focus was a paleopathological investigation of skeletal indicators of stress. However, the mean age at death was calculated for the three sites by averaging the point age estimation for each individual in the population and was completed following that which was used in Davidson et al. (2002).

Freedman's and Cedar Grove Cemeteries were previously aged and sexed by other investigators. These data were gathered from site reports, publications, and the Western Hemisphere Database (Steckel et al. 2002). The methods used to determine age and sex were consistent with those considered most accurate by the anthropological community. Skeletal analysis of Providence Baptist Church Cemetery consisting of the sex, age, stature, and ancestry of each individual, was completed by Rebecca J. Wilson and Dr. Lee Meadows Jantz. An outline of the inventory, age, sex, stature, and ancestry techniques applied with corresponding data forms can be found in Appendix B.

Table 3: Sex and Age Distribution of the Providence Baptist Church Skeletal Series.

	Male	Female	Indeterminate
Birth-0.5	--	--	11
1-4	--	--	5
5-9	--	--	5
10-14	1	1	2
15-20	1	2	--
20-30	1	--	--
30-40	10	6	--
40-50	3	2	--
50-60	1	2	--
60+	4	5	--
Totals	21	18	23

Table 4: Demographic Composition of Freedman's, Cedar Grove, and Providence Baptist Collections.

	Freedman's		Cedar Grove		Providence Baptist	
Group	N	%	N	%	N	%
Male	233	26.4	15	18.8	21	33.9
Female	232	26.2	21	26.2	18	29
Indet. Adult	91	10.3	0	0	0	0
Sub-adult	328	37.1	44	55	23	37.1
Total	884	100.0	80	100	62	100
Infants (age < 1 year)	209	23.6	22	27.5	11	17.7
Mean Age at Death	23.1		19.3		30.12	

A paleopathological analysis of the skeletal remains from the Providence Baptist Church was conducted to determine the presence of stress indicators using the Smithsonian Institution Coding System for pathology (Owsley et al. 1990). The coding instructions and forms are located in Appendix B. This approach attempts to overcome the under-reporting and over-reporting dilemma in paleopathological investigations through documenting pathology on a bone-by-bone basis. It is necessary to note the formulae used to derive percentages since missing values that are not properly accounted for create the problem of under-reporting or over-reporting (Lovell 2000). The percent of lesions is only for those elements present and not all possible elements. Hence, individuals that have a given element are the only individuals used in a comparison of that element. All analyses assessing the health within the Providence Baptist Church series used a bone by bone approach to determine relative frequencies of metabolic disorders, infection, degenerative disorders, and trauma for sub-adult, adult male and female skeletal elements.

The frequency of infectious lesions, metabolic diseases, and degenerative disorders and trauma, by sex and age categories, were calculated and tested for statistical significance using the SAS 9.1 (SAS Institute Inc. 2004) and JMP 5.1.1 (SAS Institute Inc. 2002) statistical packages. Chi-squared tests were used where appropriate to determine sex, age, and severity differences for each documented pathological condition within the Providence series. Adult males and females, between 15 and 34 years of age and those over 35, were examined separately to account for possible age differences in the pathology occurrence rates. Limited pathology data for young adults permitted detailed statistical analyses between sexes for older, 35+, individuals only.

Enamel hypoplasias in the permanent dentition were scored following the Standards for Data Collection from Human Skeletal Remains (Buikstra and Ubelaker 1994). Deciduous teeth were not scored for hypoplasias because too few teeth had complete crown development which prevented measurement of the proper crown height. Ages of occurrence for enamel hypoplasias in the Providence series were calculated using Goodman and Rose (1990) regression formulae. Independent-sample t-tests, assuming equal variance, were used to determine statistical significance for age of occurrence, and chi-squared tests were performed to determine statistical significance between frequencies of occurrence for sex and tooth using the NCSS statistical package (Hintze 2001) at the 95 percent confidence level.

Stress indicator comparisons involving all three cemeteries used an individual-based approach following the data coding scheme of the Western Hemisphere Database (Steckel et al. 2002). Refer to Appendix B for a detailed outline of this coding scheme. All of the Providence Baptist Church data were converted into this system to allow for inter-population comparisons, since Freedman and Cedar Grove data were already contained within this database. All individuals with indeterminable sex, including sub-adults and several adults, were excluded from analyses. Each population was grouped by sex. The age of adults was not factored into the analysis since previous work comparing Freedman's and Cedar Grove Cemeteries did not make this distinction. Also, individuals missing data for a specific category were eliminated from the analysis of that category in order to control for under-reporting and over-reporting. When evaluating osteoarthritis, bones were grouped into joint complexes instead of examining every element independently. These categories were: shoulder-elbow, hip-knee, wrist, hand, temporomandibular joint, cervical vertebrae, thoracic vertebrae, and lumbar vertebrae. Trauma was examined in a similar fashion. Bone categories for trauma were comprised of the arm, leg, skull, and hand. The face and nose were not examined in isolation because of missing data. Infection was analyzed through examination of the tibia and then the combined remainder of the skeleton.

The data collected were used to assess whether the frequencies of each stress indicator suggest an association between the Cedar Grove, Freedman's, and Providence Baptist Cemetery populations. Based on previous research by Davidson et al (2002), it is suggested that an urban situation, like that typified by the Freedman's Cemetery, demonstrates fewer infectious lesions, fewer metabolic stress indicators, and more degenerative disease than its rural counterpart. The probabilities of each stress indicator within the categories of degenerative disorders, metabolic disorders, infectious disease, and trauma, based on Bernoulli trials, were examined to determine frequency of occurrence differences between the three populations using chi-squared tests at a 95 percent confidence level. This presence/absence analysis permits an overall comparison between individuals affected from each population, but does not account for differences in severity of expression. A chi-squared test was performed for the severity of every stress indicator to determine if the variation of severity for these indicators differed between the populations. The chi-squared test was completed for all three population samples combined, and based on these results, pair-wise Fisher's Exact tests were performed for each set of data using the SAS 9.1 statistical package SAS Institute 2004).

The Fisher's Exact tests were utilized to determine the statistical difference, if any, that existed between each population at the 95 percent confidence level instead of chi-squared tests, because many of the levels of severity had under 5 observations. The chi-squared test is not as appropriate for such small sample sizes.

Chi-squared and Fisher's Exact tests were chosen for this analysis instead of the health index formula suggested by the Western Hemisphere Database (Steckel et al. 2002) or a log-linear model approach (Whittington 1992), because it offers the most unbiased results given the type of data. The health index is a way to assess the overall health of the population by simplifying health into one number similar to what is used in economic studies. In doing so, this formula equally weights all stress indicators for the entire population, even though previous research has demonstrated that several pathological conditions are age-related and are highly correlated. Likewise, log-linear modeling of the data could not account for multiple stress indicators simultaneously without scaling each category. It has been shown that certain features are better indicators than others, but not enough research has been completed to quantify these differences preventing arbitrary weighting of the data. Further studies using more advanced statistical modeling would be the optimal choice for paleopathogical data, but this preliminary research relies on chi-squared tests for the majority of the analyses.

The results of the chi-squared tests evaluating the frequency of occurrence in conjunction with the Fisher's Exact tests for pathology expression helped to conceptualize differences between the three cemetery populations.

Chapter 5
Results

Paleopathological Comparison for Sex and Age groups within Providence Cemetery

The Providence Baptist Church Cemetery population exhibits relatively few skeletal indicators of stress, and those indicators present are predominantly mild and in the healed state. The most prevalent pathology is degenerative joint disease or osteoarthritis with as many as 75 percent of older adults exhibiting some manifestation of the disorder. Younger adults displayed the smallest percent of all pathological conditions suggesting that an acute disease or pathology not affecting the skeleton related to their death. This section describes the results for the major skeletal pathological conditions of: degenerative disease, metabolic disorders, infectious disease, trauma, and stature, as exhibited by the Providence skeletal series.

Degenerative Disease

Osteoarthritis:

Osteoarthritis (OA) resulting in the destruction of joint surfaces is the most common disease observed in the archaeological context. This trend is seen in the Providence Cemetery population. Osteoarthritis is characterized by the initial development of osteophytes around the margin of a joint, pitting of the joint surface, and deformation of the joint. The most severe cases can exhibit eburnation, a polishing of this surface. All three manifestations of OA are visible in the Providence population. OA is typically explained as a component of senescence where a greater amount of arthritic changes occur as people age. The patterning in the Providence collection follows this expected pattern, with both males and females over 35 years demonstrating higher frequencies of OA in all joints. In fact, no females between 15 and 35 display OA of the appendicular skeleton, and only one male displays OA in any of the same bones. Hence, the analysis focuses on the older males and females to determine any significant sex differences.

Table 5 and 6 display the frequencies of mild osteoarthritis (OA) in adult males and females 35+ years old with the chi-squared statistic and its corresponding p-value for the male/female comparison of each bone evaluated. The frequency of mild OA in females is slightly greater than the males, while males have slightly higher percentages of moderate/severe OA. However, no significant differences are present in mild OA of the joint surfaces between males and females at the 95 percent confidence level. Females are marginally significant for mild OA at the right proximal humerus (p=.0701) and right proximal tibia (p=.0552). The p-values for each joint surface examined is lower in the moderate/severe category suggesting more difference between males and females, but no significant differences are found. The right proximal ulna does show marginal significance (p=.0872) for moderate/severe OA.

Osteoarthritis is prevalent in both males and females with no appreciable differences between the sexes. Overall, females display more mild osteoarthritis than males, but males demonstrate more pronounced arthritic changes. Table 7 and 8 display the male and female differences for moderate and severe osteoarthritis.

Table 5: Frequency of mild osteoarthritis on the left side in adult males and females by bone and the chi-squared test results for each bone.

Bone/joint	Male		Female		X^2	P
	N	%	N	%		
Scapula	21	28.6	16	25.0	.4081	.5229
Acetabulum	20	50.0	16	50.0	1.000	1.000
Sacroiliac	19	31.6	17	17.6	.5625	.4533
Patella	14	21.4	10	30.0	.1357	.7125
Calcaneus	16	12.5	14	35.7	1.6457	.1995
Humerus Prox	18	27.8	15	33.3	.1196	.7295
Humerus Dis	19	21.1	15	20.0	.0057	.9399
Radius Prox	14	7.1	10	10.0	.0318	.8586
Radius Dis	12	25.0	12	25.0	.0000	1.000
Ulna Prox	19	26.3	16	31.3	.3371	.5615
Ulna Dis	10	20.0	9	33.3	.4343	.5099
Femur Prox	19	36.8	14	28.6	.2481	.6184
Femur Dis	20	25.0	16	18.8	.2009	.6540
Tibia Prox	16	12.5	16	37.5	2.6667	.1025
Tibia Dis	20	30.0	15	20.0	.4487	.5029

* Denotes significant difference at α=0.05

Table 6: Frequency of mild osteoarthritis on the right side in adult males and females by bone and the chi-squared test results for each bone.

Bone/joint	Male		Female		X^2	P
	N	%	N	%		
Scapula	21	14.3	15	26.7	.5692	.4506
Acetabulum	20	50.0	15	53.3	.0122	.9121
Sacroiliac	18	33.3	16	6.3	2.5688	.1090
Patella	14	35.7	11	27.3	.2017	.6533
Calcaneus	15	20.0	13	46.2	2.1841	.1394
Humerus Prox	16	18.8	14	50.0	3.2813	.0701
Humerus Dis	18	27.8	14	28.6	.0025	.9605
Radius Prox	13	15.4	11	18.2	.0336	.8546
Radius Dis	10	10.0	10	40.0	2.400	.1213
Ulna Prox	18	33.3	16	43.8	.3892	.5327
Ulna Dis	9	33.3	9	22.2	.2769	.5987
Femur Prox	18	22.2	15	33.3	.5093	.4755
Femur Dis	20	25.0	16	25.0	.0000	1.000
Tibia Prox	17	17.6	14	50.0	3.6775	.0552
Tibia Dis	18	22.2	14	28.6	.1693	.6807

* Denotes significant difference at α=0.05

Table 7: Frequency of moderate/severe osteoarthritis on the left side in adult males and females by bone and the chi-squared test results for each bone.

Bone/joint	Male		Female		X^2	P
	N	%	N	%		
Scapula	21	4.8	16	6.3	.0237	.8778
Acetabulum	20	0.0	16	6.3	1.2857	.2568
Sacroiliac	19	5.3	17	0.0	.9203	.3374
Patella	14	7.1	10	10.0	.0623	.8028
Humerus Prox	18	5.6	15	6.7	.0177	.8940
Humerus Dis	19	5.3	15	0.0	.8134	.3671
Radius Prox	14	14.3	10	0.0	1.5584	.2119
Radius Dis	12	0.0	12	0.0	0	1
Ulna Prox	19	10.5	16	0.0	1.7863	.1814
Ulna Dis	10	10.0	9	0.0	.8612	.3534
Femur Prox	19	10.5	14	7.1	.1117	.7383
Femur Dis	20	5.0	16	18.8	1.7016	.1921
Tibia Prox	16	6.3	16	6.3	0	1

* Denotes significant difference at α=0.05

Table 8: Frequency of moderate/ severe osteoarthritis on the right side in adult males and females by bone and the chi-squared test results for each.

Bone/joint	Male		Female		X^2	P
	N	%	N	%		
Scapula	21	19.0	15	6.7	1.1245	.2896
Acetabulum	20	5.0	15	6.7	.0442	.8335
Sacroiliac	18	5.6	16	6.3	.0072	.9315
Patella	14	0.0	11	0.0	1.12	.2896
Humerus Prox	16	12.5	14	0.0	1.8750	.1709
Humerus Dis	18	11.1	14	0.0	1.6593	.1977
Radius Prox	13	15.4	11	0.0	1.8462	.1742
Radius Dis	10	10.0	10	0.0	1.0526	.3049
Ulna Prox	18	16.7	16	0.0	2.9247	.0872
Ulna Dis	9	0.0	9	0.0	0.0	0.0
Femur Prox	18	11.1	15	0.0	1.7742	.1829
Femur Dis	20	5.0	16	12.5	.6545	.4185
Tibia Prox	17	5.9	14	0.0	.8510	.3563

* Denotes significant difference at α=0.05

Porosity and eburnation are just as prevalent as osteoarthritis in which most joint surfaces are affected to some degree. The expression of porosity follows no clear patterning on joint surfaces, but does follow the same senescent trend as the other degenerative changes documented. Very few individuals display moderate or severe porosity. Porosity is more common in the vertebral column and is usually found in association with the development of eburnation and more severe OA. Eburnation is just as rare with most cases being mild. Only one younger individual, 15 to 35 years old, demonstrates eburnation which is located on the scapula. Eburnation in females is limited to the axial skeleton with the exception of mild forms found on one patella and one distal femur; whereas, males display eburnation on the shoulder, elbow, and hip joints. The shoulder joint seen in Figure 7, from Burial 8, a 60+ male, exemplifies the porosity and eburnation found in the Providence males. The female rates of eburnation found in the axial skeleton, particularly the vertebrae, are consistently higher than the males. Table 9 displays the frequency of mild vertebral eburnation for both 35+ males and females. Little moderate/severe eburnation is present. Six percent of females display eburnation of the thoracic vertebrae and 12.5 percent display eburnation of the lumbar vertebrae. Only the lumbar vertebrae in males display moderate/severe eburnation in which 5 percent of males are affected.

Osteophytosis:

Osteophytosis, a specific form of osteoarthritis that affects the vertebral column, is evident in several individuals within the Providence Cemetery. Osteophytic activity on the vertebral facets and centra is common, especially in older individuals (see Figure 8).

Table 9: Frequency of eburnation expressed in the vertebral column for adult males and females.

Bone	Males		Females	
	N	%	N	%
Cervical facet	19	5.0	3	18.75
Thoracic facet	19	0.0	3	12.5
Lumbar facet	20	15.0	6	25.0

Figure 7: The right shoulder of Burial 8, a 60+ male, displaying moderate to severe eburnation and porosity of the glenoid fossa of the scapula and humeral head with osteoarthritic development on the margins of both joint surfaces. Photograph by Dr. Lee Meadows Jantz.


Figure 8: Osteophytosis of the lower thoracic vertebra centra of Burial 21, a 60+ male. Photograph by Rebecca Wilson.

Tables 10 and 11 reflect the frequency of mild and moderate osteophytosis on the cervical, thoracic, and lumbar vertebrae of adult males and females. Table 11 does not include cervical vertebral centra, because none were affected beyond the mild state. No significant differences between males and females are visible in either the mild or moderate/severe categories. Males are marginally significant for moderate/severe OA of the cervical facets ($p=.0965$), but otherwise the percentage of occurrences is relatively similar for both sexes.

The detailed frequency tables for osteoarthritis, porosity, and eburnation separated by age and sex of the samples, and by bone and side of the elements examined, can be found in Appendix C.

Other Degenerative Disorders

Diffuse Idiopathic Skeletal Hypertrophy (DISH):

Burial 19, a 60+ year old male, provides evidence for the debilitating disorder, DISH. This individual has excessive OA on almost every joint, which is expressed as a mounding of osseous material around the joint capsule with little or no intrusion on the joint surface. Osteophytic activity includes ankylosis of the sacroiliac joints resulting in the complete fusion of the pelvis. The diagnostic candle wax appearance of the vertebral column in which there is a complete fusion of the vertebrae immobilizing the spine is absent. Instead, moderate osteophytosis is present on most vertebral centra to the extent that several thoracic vertebrae provide evidence for antemortem fusion. Also, superior and inferior osseous projections are visible on the spinous processes suggesting

Table 10: Frequency of mild osteophytosis in adult males and females by bone and the corresponding chi-squared test results for each.

Bone	Male		Female		X^2	P
	N	%	N	%		
Cervical facet	19	42.1	16	43.8	.0096	.9220
Cervical centrum	19	10.5	--	--	--	--
Thoracic facet	19	47.4	16	37.5	1.7863	.1814
Thoracic centrum	19	31.5	16	37.5	.3454	.5567
Lumbar facet	20	30.0	16	50.0	1.4961	.2213
Lumbar centrum	20	20.0	16	25.0	.12867	.7199

* Denotes significant difference at α=0.05

Table 11: Frequency of moderate and severe osteophytosis in adult males and females by bone and the corresponding chi-squared test for each bone.

Bone	Male		Female		X^2	P
	N	%	N	%		
Cervical facets	19	15.8	16	0	2.7632	.0965
Thoracic facet	19	10.5	16	6.3	.2027	.6526
Thoracic centrum	19	15.8	16	12.5	.1731	.6774
Lumbar facet	20	15.8	16	31.3	1.3580	.2439
Lumbar centrum	20	5.0	16	18.8	.0089	.9250

* Denotes significant difference at α=0.05

ossification of the supraspinous ligament. The widespread nature and severity of osteoarthritis, especially in the axial skeleton, suggests some immobilization for this individual.

Enthesophytes:

Enthesophytes are a degenerative manifestation related to activity, obesity, and age. They most commonly appear as projections from muscle attachment sites, such as the proximal ulna, innominate, femur, and calcaneus. The Providence collection follows these expectations. Figures 9 and 10 display the frequencies of enthesophytes by bone in the males and females that exhibit enthesophytosis. Males exhibit greater enthesophyte formation than females in every category except the calcaneus. There is also a clear correspondence between age and enthesophyte formation. Older males display enthesophytes on every bone except the tibiae with development on the left or right sides being equally probable.

Females follow a similar age trend with most incidences of enthesophytosis documented in older individuals. However, the right side is favored in the upper limb, while the left side is favored in the lower limb. Also, enthesophytes are more common in the lower limb, especially the calcaneus.

Metabolic Stress

Enamel Hypoplasia:

Enamel hypoplasia, linked to non-specific childhood stress, is uncommon in the

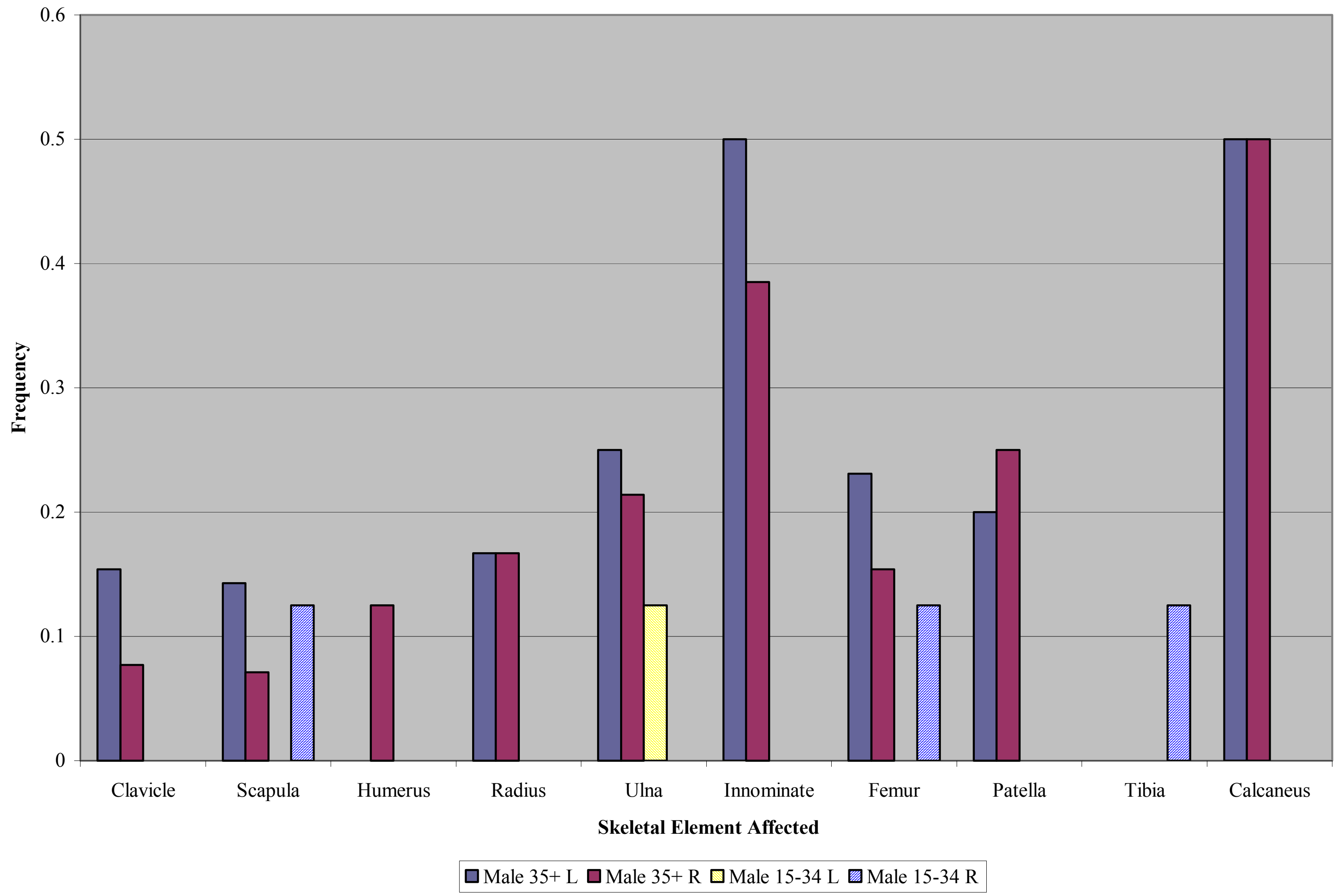

Figure 9: Frequency of adult males with enthesophytes by skeletal element and side.

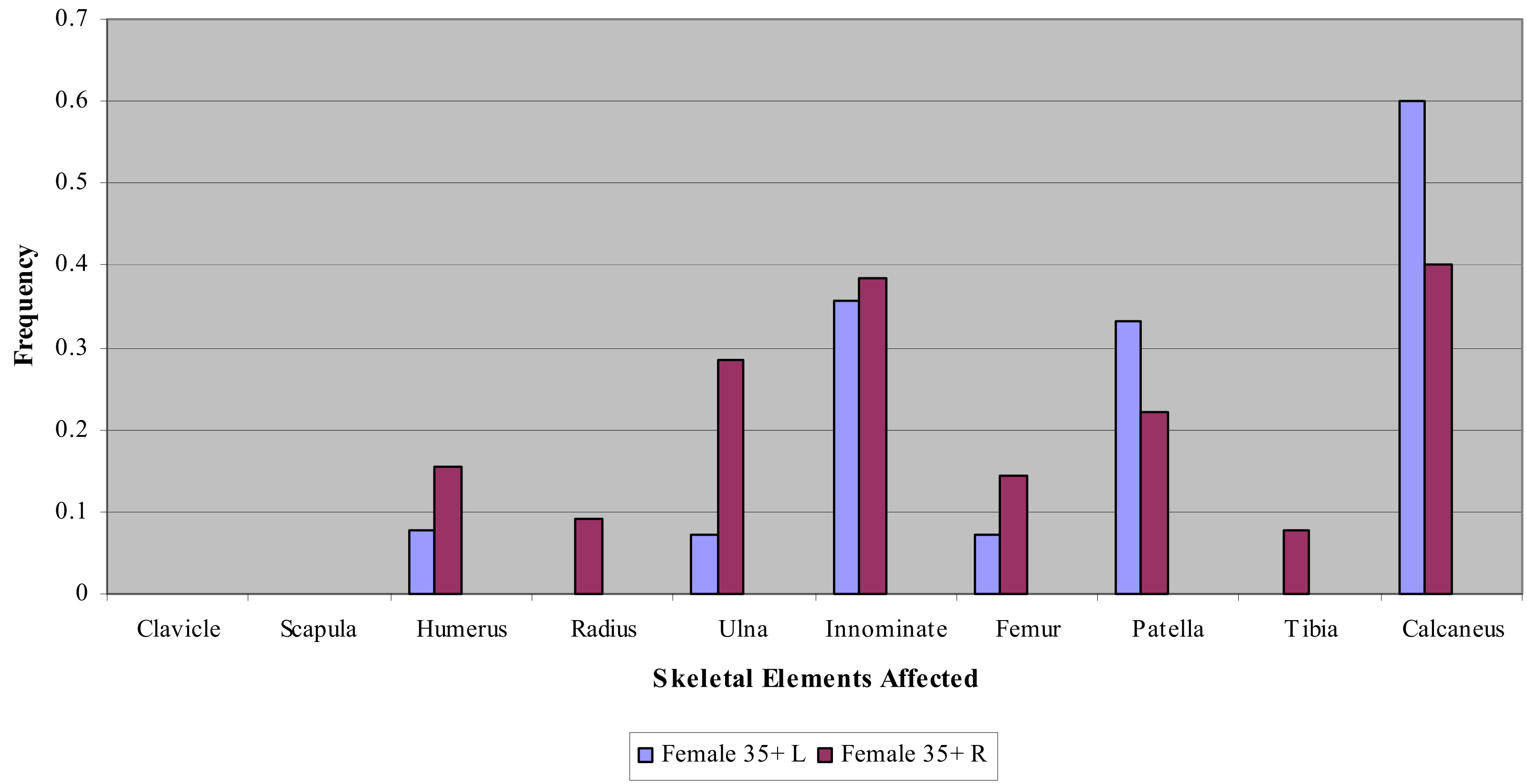

Figure 10: Frequency of enthesophytes in adult females by skeletal element and side.

Providence Cemetery series. Most scored features are small, single linear enamel hypoplasias on the anterior dentition. Only a few individuals demonstrated enamel hypoplasias with measurable widths indicating that the hypoplasias-inducing stressors were of an acute variety. Those teeth demonstrating several linear enamel hypoplasias and that had measurable widths were found in the same individuals. In particular, two burials displayed hypoplasias on several teeth simultaneously, suggesting that these individuals experienced multiple stress episodes during the dental development period. Figures 11 and 12 illustrate the frequencies of multiple defects by permanent tooth type for the maxillary and mandibular dentition. No significant differences are noted for frequencies between the maxillary and mandibular permanent dentition.

Also, significant differences between males and females in hypoplasia presence is absent in all but the maxillary central incisor using the chi-squared test (X^2=4.36, p=.0368). The results for the chi-squared test can be seen in Table 12.

The overall average age of occurrence was 3.16 years with a standard deviation of .326 years. The minimum calculated age of occurrence is 1.81 years, while the highest is 4.6 years. Table 13 lists the mean age of defect formation for each tooth type, results of the t-tests, and associated p-values for this comparison. No significant differences are visible between tooth type and age of occurrence between males and females. These results suggest that both males and females were similarly affected by childhood stressors impacting the dentition.

Cribra Orbitalia, Porotic Hyperostosis, and Ectocranial Porosity:

Cribra orbitalia, porotic hyperostosis, and ectocranial porosity are all manifested

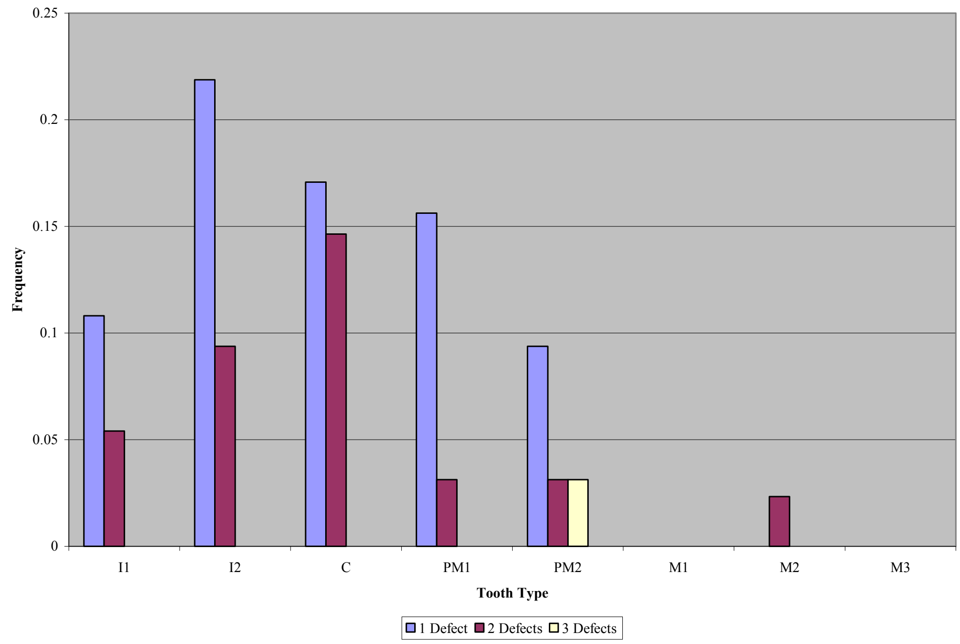

Figure 11: Frequency of number of defects by tooth in the maxillary dentition.

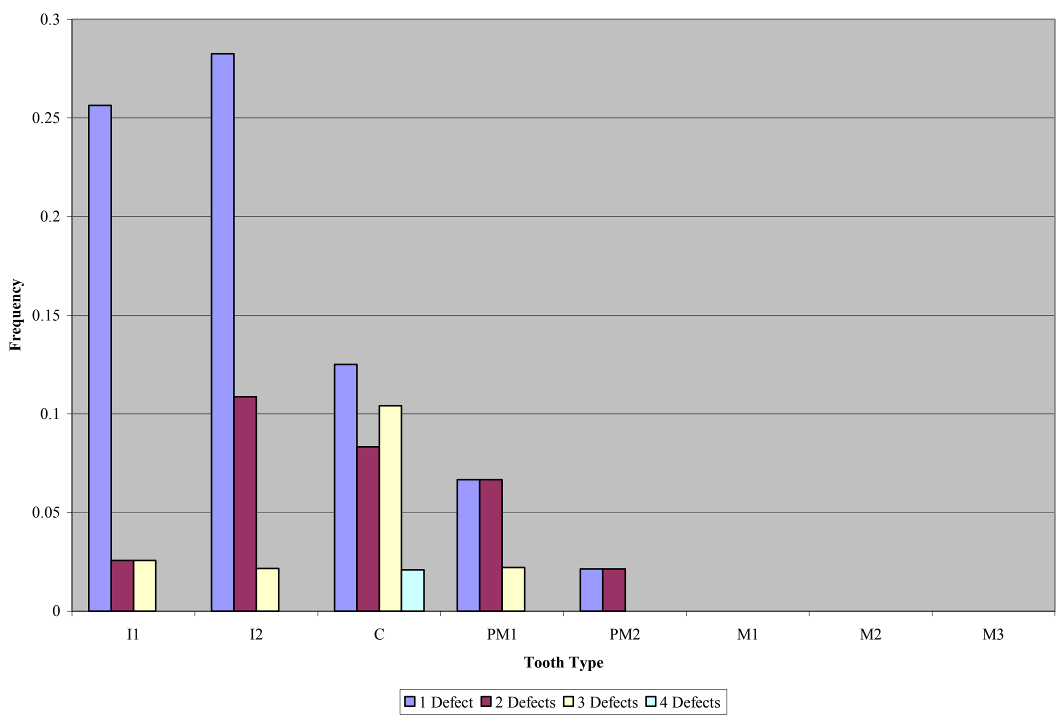

Figure 12: Frequency of number of defects by tooth in the mandibular dentition.

Table 12: Results of the chi-squared test of independence between males and females for frequency of affected teeth by tooth type.

Tooth Type	Males		Females		X^2	P
Maxillary	Affected/N	%	Affected/N	%		
I1	6/23	26.1	0/14	0	4.36	**.0368***
I2	2/19	10.1	2/13	15.4	.1666	.6832
C	6/23	26.1	6/18	33.3	.2561	.6128
P1	3/25	12.0	3/17	17.6	.2635	.6077
P2	3/22	13.6	1/10	10.0	.0831	.7731
M1	0/31	0	0/12	0	0	0
M2	1/24	4.2	0/13	0	.5567	.4556
Mandibular						
I1	5/21	23.8	5/18	27.8	.0800	.7772
I2	10/26	38.5	4/20	20.0	1.8198	.1773
C	12/27	44.4	8/21	38.1	.1959	.6580
P1	5/25	20.0	1/20	5.0	2.1635	.1413
P2	2/29	6.9	0/18	0	1.2966	.2548
M1	0/23	0	0/16	0	0	0
M2	0/22	0	0/15	0	0	0

* Denotes significant difference at α=0.05

Table 13: Independent t-test results for age of occurrence of hypoplasias between males and females.

Tooth type	Female			Male			T	P
Maxillary	Age Mean	s.d	N	Age Mean	s.d	N		
I1	0	--	--	2.29	1.42	8	--	--
I2	3.089	0.906	8	2.391	0.664	4	-1.356	0.8975
C	3.388	0.623	10	3.23	1.08	8	-0.39	0.7015
PM1	3.76	0.883	4	3.39	1.52	3	-0.411	0.6984
PM2	2.99	0.157	2	3.89	0.663	4	1.793	0.1474
M1	0	--	--	0	--		--	--
M2	0			4.04	0.512	2		
Mandibular	Age Mean	s.d	N	Age Mean	s.d	N		
I1	2.967	0.349	4	2.341	0.72	7	-1.607	0.1425
I2	2.644	0.156	4	2.308	0.6338	14	-1.03	0.3182
C	3.743	0.871	15	3.803	1.015	23	0.188	0.8519
PM1	0	--	--	3.274	0.992	9	--	--
PM2	0	--	--	4.109	1.033	2	--	--
M1	0	--	--	0	--		--	--
M2	0	--	--	0	--		--	--

* Denotes significant difference at α=0.05

as some form of porosity or pitting of the cranial bones. Few individuals in the Providence Cemetery series exhibit such pathology.

Cribra orbitalia, exhibited as small pits in the orbital plates of the frontal bones, is present in four individuals: Burial 34 (30-40 year old male), Burial 41 (11.5-13 year old, possible female), Burial 52 (8-10 year old indeterminate sub-adult), and Burial 12 (35-45 year old male). Only one of these individuals demonstrates any form of cranial porosity in association with the porosity seen in the orbits. This individual, Burial 52, an 8-10 year old sub-adult, demonstrates both active porotic hyperostosis and ectocranial porosity suggesting that this person may have been afflicted by a chronic infection or anemia. Figure 13 provides an example of the extent of cribra orbitalia seen in the cemetery series.

Four individuals exhibit ectocranial porosity: Burial 39 (35-45 year old male), Burial 42 (60+ year old female), Burial 52 (8-10 year old indeterminate sub-adult), and Burial 63 (35-45 year old female). The healed ectocranial porosity visible on Burials 42 and 63 extend onto the parietals and occipitals, while Burial 39 has healed ectocranial porosity limited to the right parietal.

Infection

Evidence of infection is relatively common in the Providence Cemetery population with 41 percent of adults displaying some variety. Mild, localized areas of healed, non-specific periostitis are the primary indicators of infection present. There is no indication of severe periostitis or osteomyelitis; however, active periostitis, systemic infection, and lytic activity are present.

Figure 13: Porosity in the right superior orbit of the frontal bone from Burial 52, a 8-10 year old sub-adult, demonstrating cribra orbitalia. Photograph by Rebecca Wilson.

Tables 14 and 15 demonstrate the frequency of periostitis for adults by sex and age. Males demonstrate periostitis on the axial skeleton, while females do not show periostitis in this region. Indicators of periostitis on the appendicular skeleton account for a majority of infection. The tibiae followed by the femora display the highest frequency of periostitis, with the left side being affected more often. Also, males and females over the age of 35 demonstrate higher rates of infectious lesions than the 15-34 age category.

Four individuals demonstrate active periostitis, one of which indicates a systemic form of infection and two of which are sub-adults. Of the two sub-adults, Burial 23 (a 8-10 year old), displays active periostitis on the mandible; while the other, Burial 26 (a 6 month to 1 year old infant), displays active periostitis on the cranial bones including the frontal, right and left parietals, and occipital bones. The location of periostitis on the cranial bones in Burial 26 suggests the inauguration of a systemic infection, especially since the endocranial surface is involved (See Figure 14).

Burial 40, a 40+ year old male, demonstrates moderate, yet widespread periostitis with cortical expansion on the left tibia indicating a more substantial infection in this individual. The poor preservation of this individual prevents further conclusions.

Burial 15, a 35 to 45 year old female, has a severe localized pelvic infection. This individual has lytic activity, resulting in the destruction of most of the left sacrum and part of the left ilium with active periostitis on the rest of the left ilium, sacrum, and left proximal femur. The limited extent of the periostitis and round shape of the lytic lesion suggests a form of cancer or a tumor in this region (See Figure 15).

Table 14: Frequency of periostitis in the axial skeleton for adult males and females.

Sex/ Age	Thoracic vertebrae		Lumbar vertebrae		Sternum		Rib 2				Rib3-10				Rib 11			
	C		C		C		L		R		L		R		L		R	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Males 15-34	6	33.3	7	14.2	3	0	5	0	5	0	7	14.2	7	0	4	0	4	0
Males 35+	13	7.7	13	0	8	12.5	10	0	11	9.1	12	8.3	11	9.1	10	0	12	0
Females 35+	12	0	13	7.7	6	0	10	0	9	0	11	0	9	0	9	0	9	0

Table 15: Frequency of periostitis in the appendicular skeleton for adult males and females.

Sex/ Age	Radius				Ulna				Femur				Tibia				Fibula			
	L		R		L		R		L		R		L		R		L		R	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Males15-34	7	0	7	0	7	0	6	0	7	14.3	7	14.3	7	14.3	7	0	7	14.3	7	0
Males 35+	14	7.1	14	0	14	0	13	0	14	21.4	14	0	14	21.4	13	15.4	13	15.4	12	8.3
Females 15-34	4	0	4	0	4	0	4	0	4	0	4	0	4	0	4	25.0	4	0	4	0
Females 35+	12	8.3	13	7.7	13	7.7	13	7.7	13	15.4	13	15.4	13	23.1	13	16.7	12	16.6	12	8.3

Figure 14: Burial 26, a 6-12 month old infant, displaying active periostitis on the right parietal. Photograph by Sherri Turner.

Figure 15: Burial 15, a 35-45 year old female, exhibiting lytic activity and periostitis on the left innominate. Photograph by Sherri Turner.

Treponemal Infection:

Lesions on one individual from Providence Cemetery suggest a treponemal infection. Burial 63, a 35 to 45 year old female, demonstrates systemic infection involving every long bone except the humeri. The poor preservation of the axial skeleton and facial regions makes differential diagnosis of a specific infection difficult. However, the patterning of the periostitis on the appendicular skeleton is suggestive of a treponemal infection, with venereal syphilis being most likely (Ortner 2002). The bilateral, widespread expression on the skeletal elements, especially those of the forearm with cortical expansion of the shaft, is diagnostic of a treponemal infection (Ortner 2002). Venereal syphilis is usually diagnosed by the characteristic patterning of infection on the cranial elements that develops in the latter stages of the disease (Ortner 2002). Cranial involvement is indeterminable, but this individual does have the expected post-cranial patterning for a treponemal infection.

Tuberculosis/Pulmonary disease:

No individuals demonstrate clear evidence of tuberculosis. This is not atypical since tuberculosis affects the skeleton infrequently. Periostitis on the pleural surface of the ribs and a lytic lesion on at least one rib are present in one individual, Burial 34, a 30-40 year old male, suggesting a respiratory ailment etiology. Other individuals display plaque deposition on the pleural surfaces of the ribs, but these can be the result of severe pneumonia as well as tuberculosis. Since there is no clear vertebral involvement in any of these cases, evidence of tuberculosis in this population is inconclusive.

Sinusitis:

Bacterial infection of the nasal sinuses or dental abscesses can cause sinusitis of the maxillary sinus. Evidence of this infection is found in four individuals: Burial 13 (50-60 year old female), Burial 16 (35-45 year old male), Burial 41 (11.5-13 year old female), and Burial 46 (60+ year old male); all of which display a mild form of sinusitis. The completeness of the maxillary bones and facial region in most burials precludes the complete assessment of this pathology. Diagnosis requires the observation of the actual sinus. No sex or age patterning in those affected is noted.

Other Conditions

Congenital Scoliosis:

The Providence Cemetery population does not display much unexpected or unusual pathology. However, one individual, Burial 29, a 10-12 year old sub-adult, does provide evidence of congenital scoliosis (See Figures 16 and 17).

This individual has gross morphological changes including a lateral curvature of the spine, asymmetrical twist of the ribs, and a marked asymmetry of the lower limb resulting in the premature expression of degenerative changes. The axial skeleton exhibits porosity and osteoarthritis of the vertebral facets and an asymmetry suggesting scoliosis of the thoracic spine. Identification of a congenital spinal deformity is based only on the vertebral facet morphology and asymmetry of the ribs due to the poor preservation of the bone. Expansions of the articular facets correspond to shifts in the neural arch shape, which is expressed most dramatically in the lower thoracic vertebrae. A right-sided

Figure 16: Burial 29, a 10-12 year old sub-adult, exhibiting a lateral curvature of the vertebral column. Photograph by Rebecca Wilson.

Figure 17: Burial 29, a 10-12 year old sub-adult, demonstrating a hemimetemeric 11th thoracic vertebra. Photograph by Sherri Turner.

articular facet expansion, a twisting of the 9th through 11th thoracic neural arches, and a hemimetimeric, wedged-shaped 11th thoracic centrum indicate a lateral curvature of the spine. This curvature suggests scoliosis in which the right side is the convex side of the curve and the left is the concave side. Supporting a conclusion of scoliosis is the differential curvature of the ribs. The ribs that have a smaller angle and sit closer together are on the concave side; whereas the ribs on the convex side have a more obtuse angle and sit wider apart.

These changes, in conjunction with an early appearance of osteoarthritis on the lower thoracic vertebral facets and porosity and lipping on the lumbar vertebral facets, suggest that the scoliosis is an atypical form. Scoliosis can be the result of several factors, including a neuromuscular limb length inequality, a congenital spinal deformity, or be idiopathic in nature (most commonly appearing in adolescence). The early expression of porosity and osteoarthritic lipping on the lower thoracic and lumbar vertebra suggest an etiology other than adolescent idiopathic scoliosis. Also, hemimetimeric shifts, like which is suggested by the 11th thoracic verterbra, usually lead to congenital scoliosis. There are insufficient centra present to confirm that a congenital spinal deformity caused the scoliosis, but it is a precipitating factor.

Trauma

The Providence Church series exhibits relatively little trauma. Antemortem fractures comprise a majority of the trauma. Only one individual provides a clear indication of perimortem trauma. No clear evidence of weapon wounds is present, even though a death certificate indicates one individual died from a gun shot wound.

Antemortem trauma:

Fractures are the most common form of trauma and one of the easiest to identify in skeletal remains. The Providence Cemetery population exhibits relatively few examples of antemortem fractures. All fractures present appear to be non-pathological, resulting from trauma or injury and not the result of weakening by disease or other factors. Of those present, most are healed. Refer to Table 16 for a list of individuals demonstrating fractures and Figure 18 for frequency patterns by location in males and females.

Table 16: Individuals exhibiting fractures, elements affected, and state of the fracture.

Burial	Sex	Age	Bone	Side	State
3	Male	60+	Ribs 3-10	Left	Antemortem
8	Male	45-55	Ribs 3-10	Left	Antemortem
12	Male	35-45	Frontal		Perimortem
			Mandible		Perimortem
			Nasal	Right	Antemortem
			5th Metacarpal	Right	Antemortem
			2nd Metacarpal	Left	Antemortem
15	Female	35-45	Ulna	Right	Antemortem
16	Male	35-45	Fibula	Left	Antemortem
19	Male	60+	Ulna	Left	Antemortem
21	Male	60+	Rib 11	Left	Antemortem
			Ribs 3-10	Right	Antemortem
			Clavicle	Left	Antemortem
			5th Metacarpal	Right	Antemortem
28	Male	30-40	Maxilla	Left	Antemortem
30	Female	60+	5th Metacarpal	Left	Antemortem
42	Female	60+	Radius	Left	Antemortem
46	Male	60+	Ribs 3-10	Left	Antemortem
			Talus	Left	Antemortem

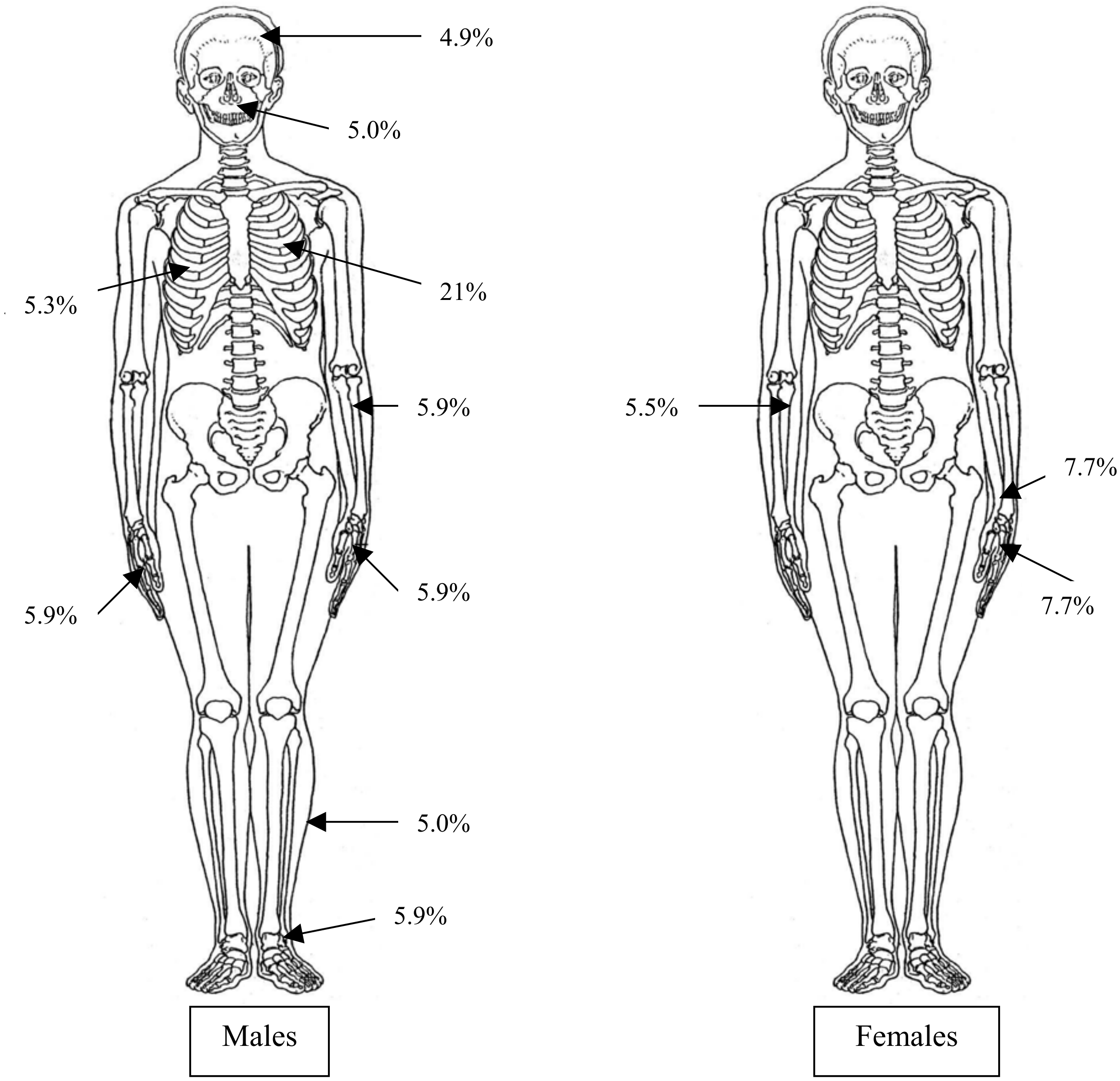

Figure 18: Frequency and patterning of trauma in males and females from the Providence Cemetery by skeletal element.

Interpersonal violence is one cause for antemortem fractures and is suggested to be on the rise during the early 20th century. One individual, Burial 19, 60+ year old male, provides evidence suggestive of a defensive fracture. The left ulna displays a healed parry fracture, resulting in the loss of movement in the left forearm as manifested by other pathological conditions occurring in the left arm (Figure 19). Other evidence of interpersonal violence is seen in Burial 12, which has a healed nasal fracture, and Burial 28, a 30-40 year old male, which has a healed left maxilla fracture.

The majority of healed fractures are seen in the hands and ribs with three and four individuals affected, respectively. There is no clear relationship between age and fracture patterning.; however, fractures in females are limited to the forearm and hand, while males display evidence of lower limb fractures. Also, all rib fractures are found in males.

Perimortem trauma:

Only one individual, Burial 12, a 35-45 year old male, indicates perimortem trauma to the extent that this person can be characterized as a traumatic death. The remains of this individual indicate massive blunt force trauma to the right side of the head with surgical intervention on the right side (Figure 20). The head is a major target of interpersonal violence and a common source of injury during a fall or other accident. In this situation the trauma appears to have been caused by at least three blows to the right side of the face and head.

Figure 19: Burial 19, a 60+ year old male, demonstrating a well healed parry fracture of the left ulna that resulted in a lateral displacement of the distal shaft of the ulna. Photograph by Sherri Turner.

Figure 20: Burial 12, a 35-45 year old male, exhibiting perimortem blunt force trauma to the anterior vault with a perimortem surgical procedure to the right, lateral vault. Photograph by Sherri Turner.

Paleopathological Comparison between the Providence Baptist Church, Freedman's Church, and Cedar Grove.

Degenerative Joint Disease

The Providence Baptist Church, Freedman's, and Cedar Grove Cemeteries all demonstrate relatively high levels of osteoarthritis. Providence Cemetery is more similar to Freedman's Cemetery in frequency of osteoarthritis in males for the shoulder-elbow, hip-knee, and temporomandibular (TMJ) joints. Cedar Grove has lower percentages of males affected by OA in the shoulder-elbow, hip-knee, and temporomandibular joint compared to Providence Cemetery. There are no significant differences in the frequency of OA of the wrist between males from the three populations, and only a significant difference between Cedar Grove and Freedman's for the hand. The frequency of OA in females is only significantly different for the TMJ, where a similarity exists between the Freedman's (33%) and Providence (23%) cemeteries while no cases were documented in Cedar Grove. Refer to Tables 17 and 18 for the percent of individuals affected and Tables 19 and 20 for the chi-squared comparison results for male and female from the Providence, Cedar Grove, and Freedman's Cemeteries.

The severity level of osteoarthritis for Freedman's Cemetery is significantly higher than both the Providence and Cedar Grove Cemeteries for males in most joint complexes, but females show little difference in severity between the three populations in most joint complexes. Osteoarthritis of the shoulder/elbow joints, hip/knee joints, and TMJ all indicate a similarity between Freedman's and Providence cemeteries where the level of severity is higher than what is seen in Cedar Grove.

Table 17: Frequency of degenerative joint disease skeletal indicators in Cedar Grove, Providence, and Freedman's Cemeteries male samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
DJDSH	14	0.0714	21	0.4762	154	0.5714
DJDHK	15	0.2667	20	0.6000	153	0.5359
DJDCER	15	0.3333	20	0.4500	93	0.4946
DJDTHO	15	0.4000	20	0.3500	66	0.3939
DJDLUM	15	0.4667	20	0.4500	75	0.5200
DJDTMJ	14	0.0000	21	0.3810	107	0.4766
DJDWR	15	0.1333	20	0.2500	122	0.2705
DJDHAND	15	0.1333	19	0.3158	129	0.4341

Table 18: Frequency of degenerative joint disease skeletal indicators in Cedar Grove, Providence, and Freedman's Cemeteries female samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
DJDSH	20	0.3000	18	0.3333	145	0.3034
DJDHK	19	0.2105	18	0.4444	138	0.3333
DJDCER	20	0.2500	19	0.4211	109	0.3853
DJDTHO	20	0.2500	19	0.5263	64	0.2656
DJDLUM	20	0.3000	18	0.5556	71	0.4085
DJDTMJ	20	0.0000	17	0.2353	104	0.3365
DJDWR	20	0.1000	18	0.1111	112	0.1696
DJDHAND	20	0.2500	16	0.3125	111	0.2342

Table 19: Chi-squared results comparing skeletal indicators of degenerative joint disease between males from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		DJDSH		DJDHK		DJDTMJ		DJDWR		DJDHAND	
		X^2	P	X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	0.6803	0.4095	0.2925	0.5886	0.6468	0.4213	0.0231	0.8793	0.9524	0.3291
40Sy619	3La	6.3857	**0.0115***	3.8377	0.0501	6.936	**0.0086***	0.7292	0.3932	1.5509	0.213
3La	41D	58.964	**<.0001***	3.9645	**0.0465***	11.5346	**0.0007***	1.2525	0.2631	5.0536	**0.0246***

* Denotes significant difference at α=0.05

Table 20: Chi-squared results comparing skeletal indicators of degenerative joint disease between females from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		DJDSH		DJDHK		DJDTMJ		DJDWR		DJDHAND	
		X^2	P	X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	0.0672	0.7954	0.8686	0.3514	0.6857	0.4076	0.3923	0.5311	0.4643	0.4956
40Sy619	3La	0.0487	0.8253	2.308	0.1287	5.2763	**0.0216***	0.0124	0.9113	0.1731	0.6774
3La	41D	0.001	0.9749	1.1604	0.2814	9.377	**0.0022***	0.6152	0.4328	0.0233	0.8786

* Denotes significant difference at α=0.05

The severity level of OA is significantly different for females in only the TMJ. However, no individuals in the Cedar Grove sample exhibited OA of the TMJ. There is a marginal significance between Freedman's and Cedar Grove samples for the hip/knee complex, but otherwise levels of severity are consistent throughout the skeleton. It is notable that the p-values for the hip/knee and the shoulder/elbow are lower when compared to the other joint complexes examined, suggesting that the relationships between groups is not as high as it could be. Refer to Tables 21 and 22 for the Fisher's Exact tests comparing severity levels between the three populations. Contingency tables detailing severity levels for all skeletal indicators examined, including those for OA, metabolic stress, infection, and trauma, can be found in Appendix C.

Osteoarthritis in the axial skeleton in males and females indicates little difference in overall frequency between the three populations. The only element exhibiting a significant difference between the three populations is OA on the thoracic vertebrae in females, indicating Providence Cemetery is different than both the Freedman's and Cedar Grove Cemeteries. The Providence/Cedar Grove comparison indicates only a marginal difference between the two populations, while the Cedar Grove/Freedman's comparison indicates no difference between the two populations. Refer to Tables 17 through 18 for the frequency of occurrence and Tables 23 and 24 for the male and female comparisons of vertebral OA.

The level of severity for cervical, thoracic, and lumbar vertebrae exhibit similar findings to the frequency results. Tables 25 and 26 display the results for the Fisher's Exact test comparing all three populations and their p-values. No differences are discovered in any of the male groups except for those seen in the lumbar vertebrae.

Table 21: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of osteoarthritis by joint complex, excluding vertebrae, in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		DJDSH		DJDHK		DJDTMJ		DJDWR		DJDHAND	
All samples		8.84E-07	**0.0021***	2.29E-06	**0.0139***	4.11E-05	**7.16E-4***	0.0303	0.6187	0.0025	0.0503
Paired		X^2	p-value	X^2	p-value	X^2	p-value	X^2	p-value	X^2	p-value
40Sy619	41Dl316	0.0036	0.1105	0.0062	0.1573	0.1352	0.4767	0.2126	1	0.1233	0.456
40Sy619	3La97	0.0086	**0.0653***	0.0031	**0.0429***	0.0086	**0.0118***	0.2421	0.6722	0.1569	0.2569
3La97	41Dl316	1.94E-04	**0.0012***	5.19E-04	**0.0081***	2.31E-04	**2.82E-4***	0.1405	0.3531	0.016	**0.0264***

* Denotes significant difference at α=0.05

Table 22: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of osteoarthritis by joint complex, excluding vertebrae, in females from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		DJDSH		DJDHK		DJDTMJ		DJDWR		DJDHAND	
All samples		0.0084	0.6702	1.36E-04	0.1455	1.43E-04	**0.0023***	5.56E-02	0.8045	0.0399	0.7253
Paired		X^2	p-value	X^2	p-value	X^2	p-value	X^2	p-value	X^2	p-value
40Sy619	41Dl316	0.1559	0.831	0.0448	0.5088	0.1661	0.5774	0.2449	0.736	0.1835	0.5372
40Sy619	3La97	0.1329	0.8569	0.0133	0.116	0.036	**0.036***	0.3938	1	0.2664	0.7225
3La97	41Dl316	0.0591	0.4519	0.0042	0.0818	6.59E-04	**8.53E-4***	0.2147	0.7396	2.18E-01	1

* Denotes significant difference at α=0.05

Table 23: Chi-squared results comparing skeletal indicators of degenerative joint disease in the vertebral column between males from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		DJDCER		DJDTHO		DJDLUM	
		X^2	P	X^2	P	X^2	P
40Sy619	41D	0.1312	0.7172	0.1253	0.7233	0.3095	0.578
40Sy619	3La	0.4861	0.4857	0.0918	0.7619	0.0096	0.992
3La	41D	1.3482	0.2456	0.0019	0.9654	0.1423	0.706

* Denotes significant difference at α=0.05

Table 24: Chi-squared results comparing skeletal indicators of degenerative joint disease in the vertebral column between males from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		DJDCER		DJDTHO		DJDLUM	
		X^2	P	X^2	P	X^2	P
40Sy619	41D	0.0868	0.7683	4.5364	**0.0332***	1.2622	0.2612
40Sy619	3La	1.2827	0.2574	3.1431	0.0762	2.5381	0.1111
3La	41D	1.3362	0.2477	0.0192	0.8897	0.7754	0.3785

* Denotes significant difference at α=0.05

Table 25: The results of the pair-wise Fisher Exact tests t-tests (α=0.05) for severity of osteoarthritis by vertebrae in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		DJDCER		DJDTHO		DJDLUM	
All samples		2.01E-04	0.5445	9.33E-04	0.6692	0.0011	0.6451
Paired		X^2	P	X^2	P	X^2	P
40Sy619	41Dl316	0.023	0.7581	0.0139	0.379	0.0277	0.5494
40Sy619	3La97	0.0235	0.397	0.0772	0.9164	0.1075	1
3La97	41Dl316	0.0102	0.3102	0.0764	0.8392	3.29E-02	**5.04E-1***

* Denotes significant difference at α=0.05

Table 26: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of osteoarthritis by vertebrae in females from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		DJDCER		DJDTHO		DJDLUM	
All samples		0.0024	0.7464	1.20E-04	**0.0343***	0.0012	0.5157
Paired		X^2	P	X^2	P	X^2	P
40Sy619	41Dl316	0.0406	0.5238	0.0157	0.0553	0.0391	0.5602
40Sy619	3La97	0.0565	0.4921	0.0054	**0.0326***	0.0283	0.2199
3La97	41Dl316	0.069	0.9239	0.0168	0.1767	0.0437	0.6206

* Denotes significant difference at α=0.05

A difference in osteoarthritis of the vertebrae between Freedman's and Cedar Grove's is noted, but Providence cemetery does not demonstrate significant differences from either cemetery. The greatest differences in severity, with the lowest p-values, are located in the thoracic vertebrae of females. Marginal significance is present between Providence and Freedman's samples, while there is a significant difference at the 95 percent confidence level for Providence and Cedar Grove comparisons. No difference is noted between Freedman's and Cedar Grove, though. Contingency tables of severity levels for each skeletal indicator examined, grouped by the major category, are located in Appendix C.

Metabolic Stress

The Providence Baptist Cemetery displays limited evidence for any metabolic disorders. When compared with both the Freedman's and Cedar Grove populations, Providence demonstrates different results between stress indicators. However, most categories indicate a difference between Providence and Cedar Grove and only a marginal one, if at all, between Providence and Freedman's suggesting that the frequencies of these pathological conditions are more similar in the Providence-Freedman's comparison. Refer to Tables 27 through 30 for the male and female frequency of occurrence and chi-squared tests comparing the three populations for linear enamel hypoplasias, cribra orbitalia, and porotic hyperostosis.

The frequency of linear enamel hypoplasias on the incisor is similar between Providence and Freedman's males and significantly different than Cedar Grove with 90.9

Table 27: Frequency of metabolic skeletal indicators of stress in Cedar Grove, Providence, and Freedman's Cemeteries male samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
LEH incisor	11	0.9091	15	0.2667	242	0.2892
LEH canine	12	1.0000	17	0.4118	254	0.6575
Cribra orbitalia	14	0.2143	21	0.0952	111	0.0901
PH	14	0.3571	21	0.0000	220	0.0409

Table 28: Frequency of metabolic skeletal indicators of stress in Cedar Grove, Providence, and Freedman's Cemeteries female samples.

	Cedar Grove		Providence		Freedman	
Indicator	N	Frequency	N	Frequency	N	Frequency
LEH incisor	14	0.7143	13	0.0769	228	0.2018
LEH canine	17	0.7647	14	0.3571	244	0.5082
Cribra orbitalia	21	0.0476	17	0.0588	94	0.0957
PH	21	0.2381	17	0.0000	219	0.0959

Table 29: Chi-squared results comparing metabolic stress indicators between males from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		LEH incisor		LEH canine		Cribra orbitalia		PH	
		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	0.0352	0.8513	4.186	**0.0408***	0.0057	0.94	1.6824	0.1946
40Sy619	3La	10.5388	**0.0012***	10.774	**0.001***	0.9722	0.3241	7.5879	**0.0056***
3La	41D	18.6958	**<.0001***	6.1079	**0.0135***	2.0578	0.1514	8.0623	**0.0033***

* Denotes significant difference at α=0.05

Table 30: Chi-squared results comparing metabolic stress indicators between males from the Providence (40Sy619), Cedar Grove (3La97), and Freedman's (41Dl316) Cemetery populations.

Comparisons		LEH incisor		LEH canine		Cribra orbitalia		PH	
		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	1.2208	0.2692	1.2084	0.2716	0.2394	0.6246	1.7894	0.181
40Sy619	3La	11.3422	**0.0008***	5.2374	**0.0221***	0.0237	0.8778	4.6609	**0.0309***
3La	41D	19.4813	**<.0001***	4.1932	**0.0406***	0.5007	0.4792	4.0116	**0.0452***

* Denotes significant difference at α=0.05

percent of males affected. Females are affected similarly with Cedar Grove females having a percentage of 71.4, while frequencies of occurrence in females in Providence and Freedman's are much lower. The occurrence of linear enamel hypoplasias on the canine is significantly different for males in all populations, but females display a similarity between Providence and Freedman's.

The severity of linear enamel hypoplasias on the incisor in males and females is significantly difference between Providence and Cedar Grove with a p-value less than 0.001, suggesting that Cedar Grove has more hypoplasias per tooth than the other two sampled. This is also true for the severity of hypoplasias on canines in females. The degree of severity of hypoplasias on the canine in males is significantly different between all populations with the highest p-value of 0.024 between Providence and Freedman's, suggesting a closer relationship in their expression of hypoplasias on the canine

Little evidence of cribra orbitalia was detected in any of the populations. As a result, no significant differences exist in frequency of cribra orbitalia for the three populations. The results for the pair-wise tests for severity of cribra orbitalia indicate no differences in severity between the three populations.

The frequency of porotic hyperostosis in adult males and females from the Providence cemetery is zero making it significantly different from Cedar Grove (23.8 %) but not Freedman's (9.6 %) indicating a similarity between the Freedman's and Providence populations. All populations demonstrate rather mild cases of porotic hyperostosis if any at all. A significant difference exists between Cedar Grove and Freedman's males in severity, and between Providence and Cedar Grove, which can be seen in the following tables. Unlike males, comparison of porotic hyperostosis severity in females is not statistically significant at the 95 percent level. The p-values for the pair-wise tests suggest a marginally significant difference between Providence females and Cedar Grove and between Cedar Grove and Freedman's females. This suggests that Providence is similar to Freedman's in severity of porotic hyperostosis. . Results for all metabolic stress indicators examined, including linear enamel hypoplasias, porotic hyperostosis, and cribra orbitalia, can be found in Tables 31 and 32. These tables contain the Fisher's Exact, the pair-wise tests, and the corresponding p-values for each indicator.

Infection

The Providence Cemetery displays little infection, but that which is present is mild, healed, and localized. Refer to Tables 33-36 for the frequency data and the chi-squared results comparing male and female rates of tibial and skeletal infection from the Providence sample to the Cedar Grove and Freedman's samples.

Table 31: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of metabolic indicators of stress in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		LEH incisor		LEH canine		cribra orbitalia		PH	
All samples		1.86E-09	**2.18E-6***	6.64E-08	**5.85E-5***	0.0338	0.3904	1.46E-04	**5.45E-4***
Paired		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41Dl316	0.004	0.0953	0.0055	0.1041	0.2822	1.000	0.4322	1.000
40Sy619	3La97	2.07E-4	**0.0023***	9.02E-6	**2.05E-5***	0.2028	0.4567	0.0062	**0.0062***
3La97	41Dl316	2.97E-08	**2.28E-7***	1.88E-5	**9.56E-5***	0.1115	0.2519	5.06E-4	**5.39E-4***

* Denotes significant difference at α=0.05

Table 32: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of metabolic indicators of stress in females from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		LEH incisor		LEH canine		cribra orbitalia		PH	
All samples		1.18E-8	**3.60E-6***	9.05E-8	**1.05E-4***	0.1097	0.8852	0.0068	**0.0479***
Paired		X^2	p-value	X^2	p-value	X^2	p-value	X^2	p-value
40Sy619	41Dl316	0.1412	0.8379	0.0257	0.3787	0.3508	1	0.1933	0.3758
40Sy619	3La97	2.72E-4	**0.0011***	0.0037	**0.0171***	0.5078	1	0.0405	0.0529
3La97	41Dl316	1.32E-7	**6.36E-7***	3.31E-6	**3.08E-5***	0.2997	0.6864	0.0446	0.0604

* Denotes significant difference at α=0.05

Table 33: Frequency of skeletal indicators of infection in males from the Cedar Grove, Providence, and Freedman's Cemetery samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
Tibia infection	15	0.6667	21	0.1905	241	0.5228
Skeletal infection	15	0.8667	21	0.4286	287	0.4425

Table 34: Frequency of skeletal indicators of infection in females from the Cedar Grove, Providence, and Freedman's Cemetery samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
Tibia infection	20	0.4500	19	0.1579	214	0.5047
Skeletal infection	21	0.5238	19	0.3158	278	0.4173

Table 35: Chi-squared results comparing the frequency of skeletal indicators of infection in males from the Cedar Grove, Providence, and Freedman's Cemetery samples.

Comparisons		tibial infection		skeletal infection	
		X^2	P	X^2	P
40Sy619	41D	8.5349	**0.0035***	0.0154	0.9012
40Sy619	3La	8.3488	**0.0039***	7.0664	**0.0072***
3La	41D	1.1733	0.2787	10.3132	**0.0013***

* Denotes significant difference at α=0.05

Table 36: Chi-squared results comparing the frequency of skeletal indicators of infection in males from the Cedar Grove, Providence, and Freedman's Cemetery samples.

Comparisons		tibial infection		skeletal infection	
		X^2	P	X^2	P
40Sy619	41D	8.4129	**0.0037***	0.7566	0.3844
40Sy619	3La	3.9029	**0.0482***	1.7663	0.1838
3La	41D	0.2187	0.64	0.9071	0.3409

* Denotes significant difference at α=0.05

The frequency of tibial infection in males and females in the Freedman's and Cedar Grove Cemeteries is greater than the Providence Cemetery, which has frequencies of 19.4 percent in males and 15.8 percent in females. This is indicated by a significant difference between the Providence Cemetery and the other two cemetery populations for males and females. The severity of tibial infections in males suggests a Providence-Freedman's (p=0.6159) relationship, while the p-value (0.0001) for the Providence-Cedar Grove analysis indicates a significant difference between them (See Table 37). Female severity levels indicate differences between all sites with Providence females having the least severe expressions of tibial infection (See Table 38).

The frequency of skeletal infection suggests an association between the Providence and Freedman's male samples. Both populations have less skeletal infection than the Cedar Grove sample. Cedar Grove exhibits periostitis on 86.6 percent of males for any bone other than the tibia, while Providence has 42.8 and Freedman's has 44.3 percent of males affected, respectively. The proportion of females affected in each

Table 37: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of skeletal indicators of infection in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		tibial infection		skeletal infection	
All samples		6.91E-10	**2.87E-5***	2.81E-8	**6.43E-8***
Paired		X^2	P	X^2	P
40Sy619	41Dl316	2.36E-4	**0.0163***	1.69E-05	**1.69E-5***
40Sy619	3La97	5.95E-4	**0.0091***	0.1857	0.2403
3La97	41Dl316	2.81E-6	**1.25E-4***	4.94E-04	**5.45E-4***

* Denotes significant difference at α=0.05

Table 38: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of skeletal indicators of infection in females from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		tibial infection		skeletal infection	
All samples		2.74E-06	0.0346	1.02E-09	1.06E-09
Paired		X^2	P	X^2	P
40Sy619	41Dl316	2.12E-04	**0.0097**	0.0023	**0.0024**
40Sy619	3La97	0.0079	0.1553	0.3529	0.3529
3La97	41Dl316	0.0115	0.4518	1.29E-07	**1.29E-07**

* Denotes significant difference at α=0.05

population indicates no significant difference between the three populations. The results of severity expression for skeletal infection in males suggests a Providence-Freedman's relationship in which both male samples have less severe expressions of periostitis than Cedar Grove. The female sample from Providence is significantly different than both Cedar Grove and Freedman's with Providence females having less severe periostitis than either group.

The similarity in expression of the skeletal indicators of infection for all three cemetery populations may be the consequence of the varying expressions of infection found in each population. The similarity in severity between sites may be the result of several individuals expressing mild infection in the Providence population conflating the difference between individuals in the Cedar Grove population, which display severe and systemic infection. Hence, it is quite possible that the analysis may not be compensating for non-random variation of expression.

Trauma

No significant differences in the frequency of arm, skull, and hand trauma are evident in males, while there is a difference in the frequency of leg trauma in males among the three populations. The trauma examined focused primarily on fractures, without making a distinction between perimortem and antemortem varieties. Any trauma indicating a weapon wound was separated into another category, which was not used in this analysis. Differences present between groups emphasize the quality of healing.

The frequency of leg trauma indicates a similarity between the Providence and the Freedman's populations, but not Cedar Grove. Females demonstrate a significant difference in frequency of trauma for the arm and hand. The frequency of arm trauma indicates a relationship between Providence and Cedar Grove, but not one to the Freedman's sample. A significant difference in hand trauma in females is present between Providence and Freedman's only, while no difference is indicated by the other two group comparisons. However, the Providence and Cedar Grove populations have no females exhibiting skull, leg or hand trauma, while the Freedman's Cemetery does. Refer to Tables 39 through 42 for the frequency of trauma in males and females from the three population samples, as well as the chi-squared comparisons of these frequencies. The severity of trauma exhibited in males provides evidence of differential patterning between sites. The severity of trauma takes in consideration evidence of setting, type of displacement if any, and extent of a fracture. Severity of trauma in the leg indicates a difference between Freedman's and Cedar Grove males, while severity of trauma in the arm suggests a Providence-Cedar Grove relationship for females in which there is a significant difference between Providence and Freedman's and between Cedar Grove and Freedman's. Severity of trauma in the hand suggests a difference between Providence and Freedman's male samples, but not one between either Providence and Cedar Grove or Cedar Grove and Freedman's. No differences in the severity of trauma for the skull are indicated by the results for both males and females. Refer to Tables 43 and 44 for the pair-wise tests comparing expression of severity for each category of trauma.

Table 39: Frequency of skeletal indicators of trauma in males from the Cedar Grove, Providence, and Freedman's Cemetery samples.

	Cedar Grove		Providence		Freedman's	
Indicator	N	Frequency	N	Frequency	N	Frequency
Trarm	15	0.0667	21	0.0476	218	0.0321
Trleg	15	0.3333	21	0.0476	240	0.0625
Trskul	15	0.2000	21	0.0476	232	0.0560
Trhan	15	0.2000	18	0.1667	115	0.0870

Table 40: Frequency of skeletal indicators of trauma in females from the Cedar Grove, Providence, and Freedman's Cemetery samples.

	Cedar Grove		Providence			
Indicator	N	Frequency	N	Frequency	N	Frequency
Trarm	20	0.1500	18	0.1111	193	0.0104
Trleg	20	0.0000	18	0.0000	214	0.0234
Trskul	21	0.0000	17	0.0000	230	0.0304
Trhan	20	0.0000	16	0.0625	98	0.0000

Table 41: Chi-squared results comparing frequency of skeletal indicators of trauma in males from the Cedar Grove (3La97), Providence (40Sy619), and Freedman's (41Dl316) Cemetery samples.

Comparisons		Trarm		Trleg		Trskull		Trhand	
		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	0.1424	0.7059	0.7229	0.3952	0.0261	0.8717	0.1213	0.2896
40Sy619	3La	0.0605	0.8057	5.1429	**0.0233***	2.0571	0.1515	0.0611	0.8047
3La	41D	0.5055	0.4771	6.1679	**0.013***	4.82	**0.0281***	1.8841	0.1699

* Denotes significant difference at α=0.05

Table 42: Chi-squared results comparing frequency of skeletal indicators of trauma in females from the Cedar Grove (3La97), Providence (40Sy619), and Freedman's (41Dl316) Cemetery samples.

Comparisons		Trarm		Trleg		Trskull		Trhand	
		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41D	47.0817	**<.0001***	0.4298	0.5121	0.5325	0.4656	0.1792	**0.0129***
40Sy619	3La	1.7617	0.1844	-	-	-	-	1.2857	0.2568
3La	41D	15.4148	**<.0001***	0.4775	0.489	0.6515	0.4175	-	-

* Denotes significant difference at α=0.05

Table 43: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of skeletal indicators of trauma in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		Trarm		Trleg		Trskull		Trhand	
All Samples		0.0317	0.2444	3.61E-05	**0.0163**	0.0195	0.1107	0.0259	0.1979
Paired		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41Dl316	0.1416	0.2919	0.2631	1	0.3855	1	0.1724	0.3858
40Sy619	3La97	0.25	0.6667	0.0136	0.2257	0.1622	0.287	0.3352	1
3La97	41Dl316	0.2489	0.4191	1.62E-04	**0.0035***	0.0529	0.0635	0.1315	0.1771

* Denotes significant difference at α=0.05

Table 44: The results of the pair-wise Fisher's Exact tests (α=0.05) for severity of skeletal indicators of trauma in males from the Providence Baptist (40Sy619), Cedar Grove (3La97) and Freedman's Cemetery (41Dl316) populations.

Comparisons		Trarm		Trleg		Trskull		Trhand	
All Samples		9.45E-5	**0.0015***	0.4298	1	0.3384	1	0.1194	0.1194
Paired		X^2	P	X^2	P	X^2	P	X^2	P
40Sy619	41Dl316	0.0194	**0.0411***	0.651	1	0.6032	1	0.1404	0.1404
40Sy619	3La97	0.1016	0.605	-	-	-	-	0.4444	0.4444
3La97	41Dl316	0.0036	**0.0063***	0.6371	1	0.5383	1	-	-

* Denotes significant difference at α=0.05

Stature of the Providence Baptist Cemetery in Relation to other Black Populations, including Cedar Grove and Freedman's Cemeteries

The mean stature for males (N=19) in the Providence Baptist Church Cemetery is 169.17 cm. Female statures (N=14) are significantly shorter at 160 cm using a two-sample t-test (t= -4.53, p-value = 0.00005). Table 45 provides the mean statures with the corresponding standard deviations for males and females from twelve Black skeletal series including those from the Providence Baptist Church Cemetery series. Figure 21 is a graphical representation of the male and female statures from the Providence Baptist Church Cemetery compared to these other Black skeletal series. This graph indicates that Phillips Memorial is much shorter and Oakland is relatively taller than most other populations, but both populations have extremely small sample sizes, skewing the data. A similarity is present between Elko Switch, Mother UAME, and Providence Baptist for males with an average stature around 170 cm. Statures of females from the Providence Cemetery are more similar to the Terry Collection and 38Ch778. Overall, there is a similarity in height between the populations. Comparisons between the populations are limited by the method used to estimate stature being unknown for several of the samples Nine of the twelve Black skeletal series, for which both stature and its standard deviation were known, were used to examine significant differences between populations. Tables 46 and 47 express the level of significance from a series of independent sample t-tests performed for male and female statures using the NCSS statistical package (Hintz 2001). Providence Baptist Church Cemetery demonstrated significant differences from the Terry collection (p-value=0.0217) and Cedar Grove (p-value= 0.0057) skeletal series for males with no significant difference between the female groups.

Table 45: Statures for Blackes from selected skeletal series.

Skeletal Series	Time Period	N	Female Stature	Std Dev	N	Male Stature	Std Dev	Source
Catoctin Furnace	1790-1840	8	156.4	5.5	7	171.6	4.8	Angel et al 1987
FABC 8th Street	1823-1843	34	156.7	20.4?	34	172.2	4.4	Rankin-Hill 1997
38Ch778	1840-1870	15	160.6	6.1	13	167.4	7.5	Rathbun 1987
Elko Switch	1850-1920	7	155.7	-	5	170.2	-	Shogren et al 1989
Mother UAME Church	1850s-1920	57	159.18	5.16	63	169.81	6.14	Hazel 1998
Terry Collection	1840-1924	177	160.9	6.5	360	172.7	7.8	Trotter & Gleser 1952
Oakland	1866-1884	2	168.5	-	2	177.5	-	Blakely & Beck 1982
Freedman's	1869-1907	84	159.3	4.6	98	171.1	4.7	Condon et al. 1998
Cedar Grove	1890-1927	17	163.02	5.3	11	176.85	6.8	Rose 1987 & Boudreaux 1999
Phillips Memorial	1890-1930	1	138.6	-	2	159	-	Dockall et al. 1996
Providence Baptist	1900-1935	14	160.37	4.85	19	169.17	5.95	Jantz et al n.d.

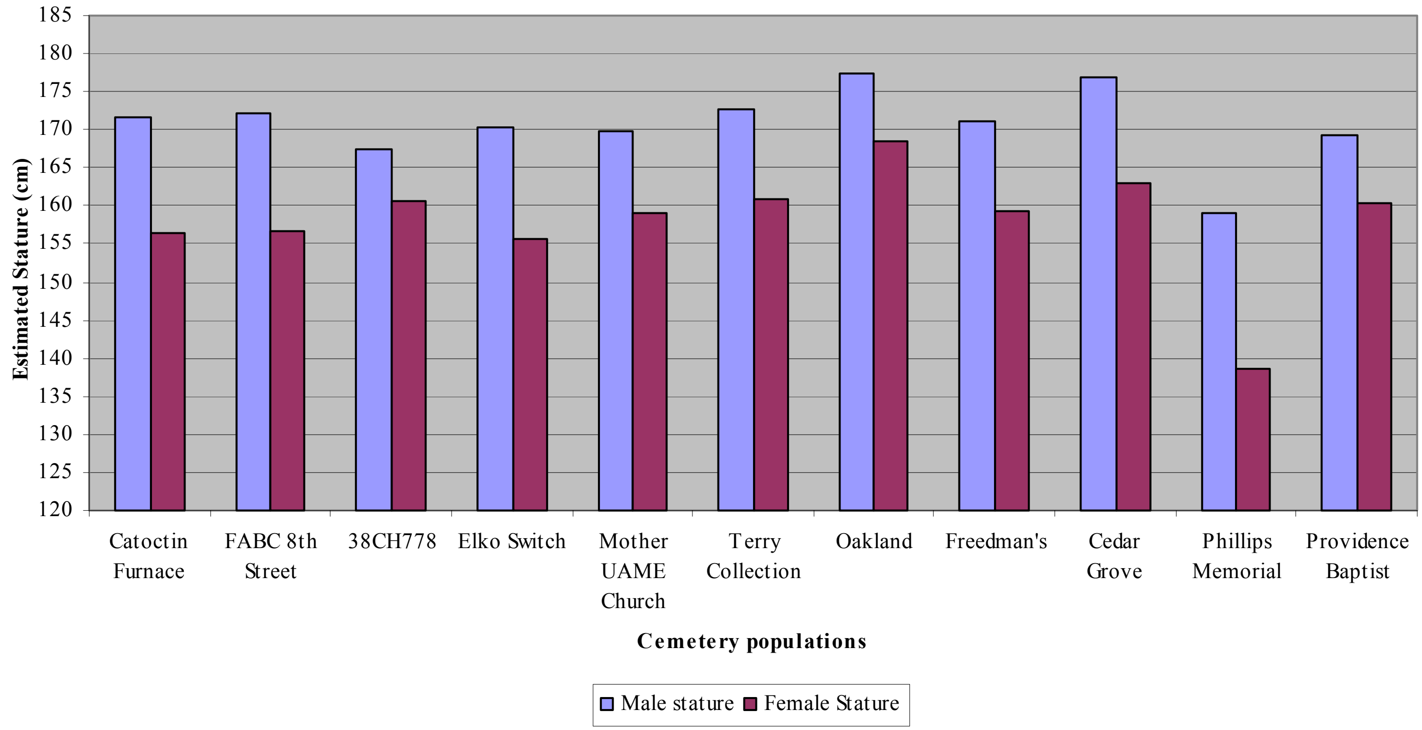

Figure 21: Comparison of stature estimates between Providence Baptist Church Cemetery and selected populations.

Table 46: Independent group t-tests for female statures using nine Black sites.

Skeletal Series	Catoctin	FABC	38CH778	UAME	Terry	Freedman's	Cedar Grove	Providence
Catoctin Furnace	0	0.9676	0.1193	0.1616	0.0537	0.0972	**0.0082***	0.0935
FABC 8th Street		0	0.4736	0.3839	0.2426	0.4669	0.0975	0.5116
38CH778			0	0.3645	0.8633	0.3409	0.1195	0.9118
Mother UAME Church				0	**0.0428***	0.8877	**0.014***	0.4259
Terry Collection					0	**0.0233***	0.1382	0.7068
Freedman's						0	0.0135	0.4519
Cedar Grove							0	0.1575
Providence Baptist								0

* denotes significance at α=0.05.

Table 47: Independent group t-tests for female statures using nine Black sites.

Skeletal Series	Catoctin	FABC	38CH778	UAME	Terry	Freedman's	Cedar Grove	Providence
Catoctin Furnace	0	0.7677	0.1462	0.3895	0.5739	0.7976	0.0735	0.3035
FABC 8th Street		0	**0.0462***	**0.0296***	0.563	0.222	0.0533	0.0618
38CH778			0	0.2941	**0.0267***	0.106	**0.0038***	0.4844
Mother UAME Church				0	**0.0013***	0.1581	**0.0068***	0.6862
Terry Collection					0	**0.0114***	0.0731	**0.0217***
Freedman's						0	**0.0194***	0.1951
Cedar Grove							0	**0.0057***
Providence Baptist								0

* denotes significance at α=0.05.

The male and female stature estimations from the Providence Cemetery were graphed against statures for decades of birth between 1840 and 1960 from the Terry Collection and the Forensic Data Bank (Meadows Jantz 1996) (see Figure 22). The cemetery means fall within the later 19th century range, which would be consistent with the dates (1900-1935) of the church's use of the cemetery. Included in this graph are the Freedman's sample and the Cedar Grove sample demonstrating the greater overall heights of the Cedar Grove population and the relatively similar heights of the Freedman's and Providence's population for this same time period. However, Providence Baptist Church is still a little shorter than the other populations from this time period suggesting that either developmental changes may be adversely affecting adult height in the population, or that most individuals excavated had much earlier birth years as would be reflected by the older mean age at death of the Providence population.

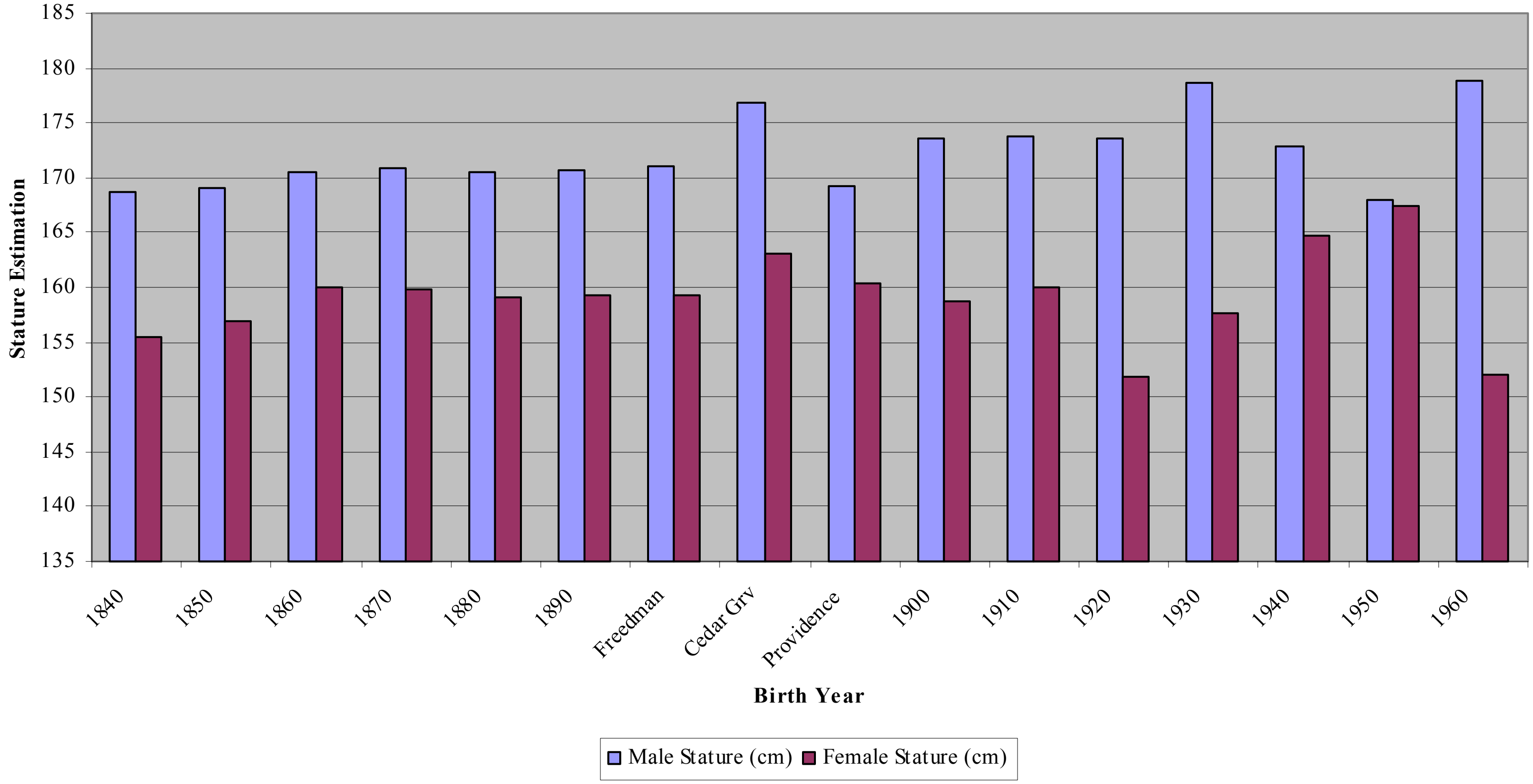

Figure 22: Comparison of the stature from Providence Cemetery to stature over time.

Chapter 6
Discussion

Paleopathological analyses of the Providence Baptist Church indicate a population that demonstrates a high level of osteoarthritis, little metabolic stress, little trauma, and moderate infection. When compared to the Cedar Grove and Freedman's Cemeteries, Providence Cemetery cannot be categorized into either the "rural" or "urban" environments using pathology exclusively. Other factors must be considered to fully explain the patterning of stress exhibited by the remains.

Situating the Providence Baptist Church Cemetery in relation to other Black sites provides evidence for this population having a relatively good health status. Rural slaves showed high rates of infection, biomechanical stress, and extremely high childhood/metabolic stress (Angel et al. 1987, Rathbun 1987). Urban slaves fared slightly better in that skeletal evidence of infection was lower, but were still stressed overall (Owsley et al. 1987, Owsley et al. 1990). Even though the Providence population had considerable osteoarthritis and other degenerative disorders, it displayed few other stressors. Even the antebellum free Black populations demonstrated more metabolic stress and more interpersonal trauma than the Providence population (Crist et al. 1997, Rankin-Hill 1997). Late 19th and early 20th century populations varied considerably based on the local economy. The urban examples had little metabolic stress, high healed, nonspecific infection, widespread, mild osteoarthritis, and higher levels of interpersonal trauma than the rural sites (Hazel 2000, Davidson et al. 2002). The rural sites displayed more metabolic stress (especially in sub-adults) more healed and systemic infection, and more widespread, severe expressions of osteoarthritis (Rose 1985, Davidson et al. 2002).

Explanations for specific pathological conditions conceptualize the urban versus rural conundrum for the late 19th and early 20th century, post-reconstruction time period in relation to the Providence Baptist Church Cemetery population.

The individuals in the Providence Cemetery indicate that those individuals, who lived long enough had some form of degeneration. Females had more widespread and milder osteoarthritis, with the arms, knees, and lower back being affected the most. This patterning is consistent with the typical female occupations of domestics, laundresses or farm workers. Males tended to have greater degeneration of the upper arm supporting the normal male activities as laborers or farmers. Most of the arthritis can be explained by senescence, especially since little early development of arthritis is noted. In this analysis, few individuals less than 30 years of age display any manifestation and that which is present is relatively mild. This corresponds to Dekker et al.'s (1992) work noting few individuals in urban areas have OA prior to the age of 30. More importantly, they state that the location and severity are more informative than overall percentages of affected individuals (Dekker et al. 1992). Most osteoarthritis in the Freedman's Cemetery population is mild, while the other two sites display more severe expressions of osteoarthritis. When severity is considered, there is a clear relationship between the Providence and Cedar Grove populations. Providence has a high percentage of individuals with severe OA with several indicating eburnation of joint surfaces. The Providence-Cedar Grove relationship is apparent in the OA of the vertebral column where the Freedman's Cemetery had relatively mild expressions.

The average rates of osteoarthritis for the Providence and Freedman's Cemeteries are much higher than the Cedar Grove rates, which correspond with Davidson et al.'s

(2002) argument for greater percentages of OA in the urban setting. According to Davidson et al. (2002), the greatest difference between manual labor in the urban and rural environment is the seasonality, moderation, and additional help available in the rural community to balance tasks, and thus decrease biomechanical stress. However, Jordan et al. (1995) indicate higher rates of degenerative joint disease in the rural environment. Individuals are required to do a multitude of tasks that place strain on several areas of the skeletons in the rural setting. The Cedar Grove population has few individuals with OA, which may be a reflection of the low mean age at death for the population. In the urban environment, the moderation of activity would be unreasonable, because goals are set by the employer not the worker (Davidson et al. 2002). Even with this longer, more stressful work day the level of osteoarthritis is predominantly mild and appears later in life. Furthermore, at the turn of the century, many Black urban dwellers turned to agriculture for work. Across the South, Jim Crowe laws lowered Black wages and prevented Blacks from obtaining skilled, high paying occupations. Davidson et al. (2002) note that agriculture was still a major occupation for Blacks in Dallas County in 1910, with 39 percent of Blacks counted being employed in agriculture. The pattern and severity of the arthritis found in the Providence Cemetery population is more similar to the rural Cedar Grove Cemetery, while the overall percentage of affected individuals is more similar to the urban Freedman's Cemetery.

Osteoarthritis may be a good indicator of activity, but may not be as suitable to determine the place of residence for certain individuals, especially those on the periphery of metropolitan areas. Both the urban and rural conditions had high physical activity levels, but the evaluation of the data suggests that rural environments may also have high percentages of OA, but more severe OA as a result of greater biomechanical stress. In the Providence Cemetery, it would be possible to find both the urban and rural patterns because of the migration of individuals to and from the city.

When metabolic indicators of childhood stress are examined, the Providence Cemetery is more similar to the urban situation as outlined by Davidson et al. (2002). Neither the Freedman's nor the Providence populations demonstrated any porotic hyperostosis, but two adults from Providence did exhibit cribra orbitalia. Even with these two individuals exhibiting cribra orbitalia, stress indicators suggest childhood for the Providence Church community was not as stressed as the Freedman's or Cedar Grove Cemeteries. The absence of these traditional indicators of nutritional stress supports the idea of a better diet and access to resources. In Cedar Grove, both cribra orbitalia and porotic hyperostosis can be explained by the seasonality of food sources, a high corn diet, and high rates of infection which makes people more susceptible to metabolic disorders (Rose 1985). The rural nutritional discrepancies would have been exacerbated by the boll weevil infestation and the unstable cotton prices, since cotton was the major cash crop for much of the rural South. The proximity to Memphis, a growing metropolis and trade center, made available greater varieties of food sources which would off-set dietary deficiencies, as well as provide better access to healthcare to potentially prevent the spread of infection.

Hypoplasia data further support limited metabolic stress. The Providence population demonstrated mild hypoplasias in which only one hypoplasia present per tooth suggests acute illnesses or other mild factors affecting the population. Furthermore, the hypoplasia expression may correspond to weaning stress since the mean age of occurrence was between 3 and 4 years, the time most children were weaned. Few individuals had multiple hypoplasias suggesting illnesses specific to these individuals and not the whole population. The metabolic stress indicators suggest that it is quite possible that the population lived in a rural area and took advantage of the available urban resources to prevent childhood stress. An investigation into childhood illnesses, growth, and development for these three populations would better explain the metabolic stresses expressed by the populations.

Dietary related metabolic stress would be lower in the urban setting because of the ability to obtain a more stable diet, but the urban inhabitants would be relatively shorter resulting from a general decrease in health. Eveleth and Tanner (1990) note that developmental stress, as reflected by stature, is affected by the environment and economy. Rural inhabitants had a greater potential for catch up growth by their increase in productivity and ability to gain more resources with adolescence, while in the urban environment most individuals had to work outside the home and purchase their food and other necessities. Even at an early age urban dwellers had a continual strain placed upon them. However, stature is inconclusive for characterizing the Providence Cemetery population as either the urban or rural. The Cedar Grove population's mean statures are higher than all other Black populations and are more similar to contemporary Blacks, even though they are the most stressed of all late post-reconstruction sites available. There seems to be a similarity across the board for all other Black populations. The Providence Cemetery is slightly shorter for males and closely related for females when compared to these other Black populations. Therefore, the Providence population is situated well within the expected statures for the late 19th and early 20th century rural and urban populations. This time period witnessed a slight decrease in stature across the board with Providence being no shorter than expected.

The rates of infection in the Providence population support a more urban situation with lower frequencies of tibial and skeletal lesions than even Freedman's Cemetery. Presence of fewer infectious lesions in the urban population may be the result of a decreased ability of the skeleton to react to acute and potentially fatal illnesses found in the urban environment. The urban Black population typically resided in the poor, crowded areas of the city where diseases such as TB and cholera were prevalent. The rates of infection in Freedman's and Cedar Grove provide evidence for several cases of systemic infection in which a treponemal infection is suggested. Only one individual in the Providence Cemetery suggests a systemic infection of this variety. Treponemal infections were a major concern in the post-reconstruction time period for Blacks (Beardsley 1987). However, Providence Cemetery does not indicate this was a major cause of death among sub-adults or adults. Most cases of infection were healed and localized, which is an expected occurrence in life. The lack of infection also indicates that other illness affected the morbidity of the individuals. Several younger individuals display no form of infection or other traumatic events, suggesting that illnesses like tuberculosis or cholera could have been a factor in their death. Tuberculosis was one of the leading causes of death among Blacks in the early 20th century and rarely affects the skeleton (Coomer 1920). More importantly, the lack of infection may be the result of access to healthcare and the augmentation of this healthcare by the church and social organizations. Participation in these groups ensured support in times of need. The First African Baptist Church Cemetery and UAME Church Cemetery display similar rates of infection as those seen in the Providence Cemetery. These two churches are known to have played a significant role in the local Black, urban community and have also been used to suggest that the church had a definitive role in Black healthcare.

The increased urbanization of the Black population in the early 20^{th} century combined with the already volatile situation across much of the South from few employment opportunities for both Whites and Blacks and institutionalized segregation suggests the presence of more trauma in the urban environment, especially interpersonal varieties. Trauma frequencies in the Providence population do not follow the expected pattern for either the rural or urban environments. Davidson et al. (2002) explain a differential pattern between the rural and urban settings in which arm fractures would be more common in females and leg fractures more common in males. They justify this pattern by suggesting the arms and legs are more prone to accident/injury for the types of activities performed. However, this idea is based only on the observed differences between the Cedar Grove and Freedman's Cemeteries. The frequency of arm fractures of males in the Providence Cemetery were higher than expected and arm fractures of females were similar to the rural situation, based on this assumption. Following Davidson et al.'s (2002) argument, the frequency of leg fractures in males followed more of an urban pattern. Only one individual exhibited a leg fracture in the Providence sample, while the females in Cedar Grove and Providence exhibited no leg fractures. The overall patterning of trauma in the Providence Cemetery is closer to Cedar Grove's patterns. Davidson et al. (2002) suggest more interpersonal trauma would be expected in the urban setting because of the increased potential of conflict associated with the early 20^{th} century urban condition. There is not enough evidence to conclude that one site or the other had higher rates of interpersonal trauma. Even though trauma has been used to differentiate populations previously, trauma does not differentiate in this analysis.

There are two major explanations to the patterning of stress in the Providence Baptist Church Cemetery: 1.) that the role and locality of the church community served as a social buffer, and 2.) that the Providence Baptist Church represents a “typical” rural community.

The Providence Baptist Church population was a rural community that had better access to healthcare and resources through its proximity to Memphis, its church affiliation, and relationship with social organizations. These associations acted as buffering mechanisms offsetting the conditions that would have promoted the occurrence of infection and metabolic disorders. Instead, a population that exhibits high bio-mechanical stress and little other skeletal pathology was discovered. An agriculture based economy would have produced the osteoarthritis scored for in the back and hands, especially the prevalence of arthritis visible in the upper neck and lumbar regions. However, the church involvement in the lives of its congregation would enable individuals to better care for the sick by providing support and resources to care for an individual. Also, social organizations, like the Knights of Tabor, provided life insurance policies for members, arranged funerals, and helped in the direct care of the sick. The support network created by such groups would have played a major role in the quality of life, and subsequently affect the skeletal health of the population.

Providence Cemetery is consistent with Cedar Grove in every aspect but infection and metabolic stress. The lack of stress indicators suggests a population that is in fairly good condition, which is opposite of the Cedar Grove Cemetery. However, Elko Switch, which is a rural site from the same time period, exhibits a similar patterning of pathology as Providence. Metabolic stress indicators, especially linear enamel hypoplasias, are limited in both the Elko Switch and Providence Cemeteries. Also, infection is not a major problem and when present is localized and in the healed state in both sites. The main difference between Cedar Grove and these two sites is skeletal infection. Cedar Grove may have had endemic diseases unique to the population, rather than high infection rates being an indicator of the rural environment. This high infection rate suggests a robust population that had a strong immunity to disease since prolonged, serious infections are those that affect the skeleton. On the other hand, Providence could represent a population more susceptible to acute illnesses that did not affect the skeleton, since there are a large number of sub-adults in the sample. As such, Providence may represent a more typical rural community in the South.

The Providence Baptist Church population is an example of how health can be affected by the community's involvement. The Providence population reflects a southern church community in a rural environment, which embodies characteristics seen in the urban situation through the utilization of the resources at its disposal. This embodiment lowers the rates of metabolic stress and infection corresponding to the living conditions of individuals, but cannot manage senescence as expressed by osteoarthritis.

Chapter 7
Conclusion

The Providence Baptist Church Cemetery sample examined is just a small sub-sample of the entire cemetery and an even smaller one of the early 20^{th} century Shelby County, Tennessee population. It still provides an avenue from which to derive information on health status and how the population mediated this health. The people interred at the Providence Baptist Church Cemetery were predominantly from the local, rural community. As the Memphis population grew from the influx of Black Americans from other areas so did the people interred at the cemetery.

The paleopathological analyses describe a population that is hard working, although whether this work was in the fields or in the factory may never be known. Skeletal indicators of degenerative disease are prevalent corresponding to intense bio-mechanical loading on the skeleton. Metabolic or developmental indicators are low. Trauma is suggestive of some interpersonal conflict, but not to a great extent. Infection is only moderately expressed and usually healed. Analyses investigating these stressors for correspondence to either the rural or urban environment in isolation produce inconclusive results; however, they are suggestive of a rural community that may not have been strictly farming. Consideration of the historical record, artifacts recovered, and locality of the church cemetery to Memphis support this conclusion.

Further paleopathological analyses should investigate the interactions of each pathological condition and try to quantify the relationship this stress has to the overall health of a population. Once these interactions between skeletal indicators of stress are better understood, comprehensive statistical tests incorporating all stress indicators can be utilized. If nothing else, this research demonstrates the need for such work. Inferences on the health of a population cannot rely on percentage of occurrence comparisons alone, but must acknowledge all the other aspects of the skeleton and a population's history.

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Appendices

Appendix A

Archaeology of the Providence Baptist Church Cemetery

Identification of Interred Individuals

Frankie LeFlore:

This individual was identified through the discovery of a headstone during excavation of the site. She was interred at the cemetery on August 18, 1926.

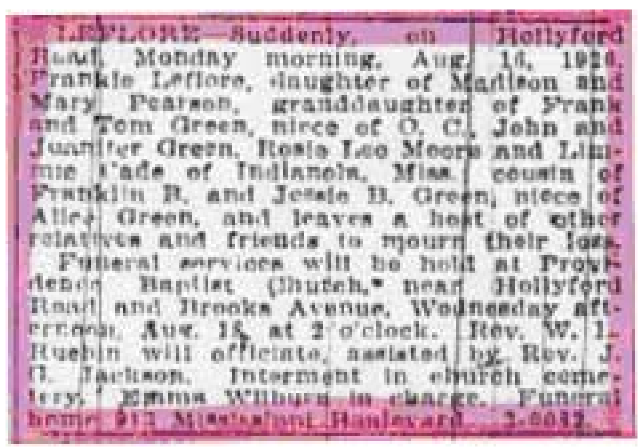
Figure A.1: Field photograph of Frankie LeFlore's tombstone. Photograph courtesy of Weaver & Associates (2003).

Inscription reads:
FRANKIE L.
LEFLORE
BORN
MAR. 24, 1913
DIED
AUG. 16, 1926

The *Commerical Appeal* obituary on August 17, 1926, reads:

LEFLORE-Suddenly, on Hollyford Road, Monday, Aug. 16, 1926, Frankie Leflore, daughter of Madison and Mary Pearson, granddaughter of Frank and Tom Green, niece of O.C. John and Juaniter Green, Rosie Lee Moore, and Limmie Cade of Indianola, Miss, cousin of Franklin B. and Jessie B. Green, niece of Allee Green, and leaves a host of other relatives and friends to mourn her loss

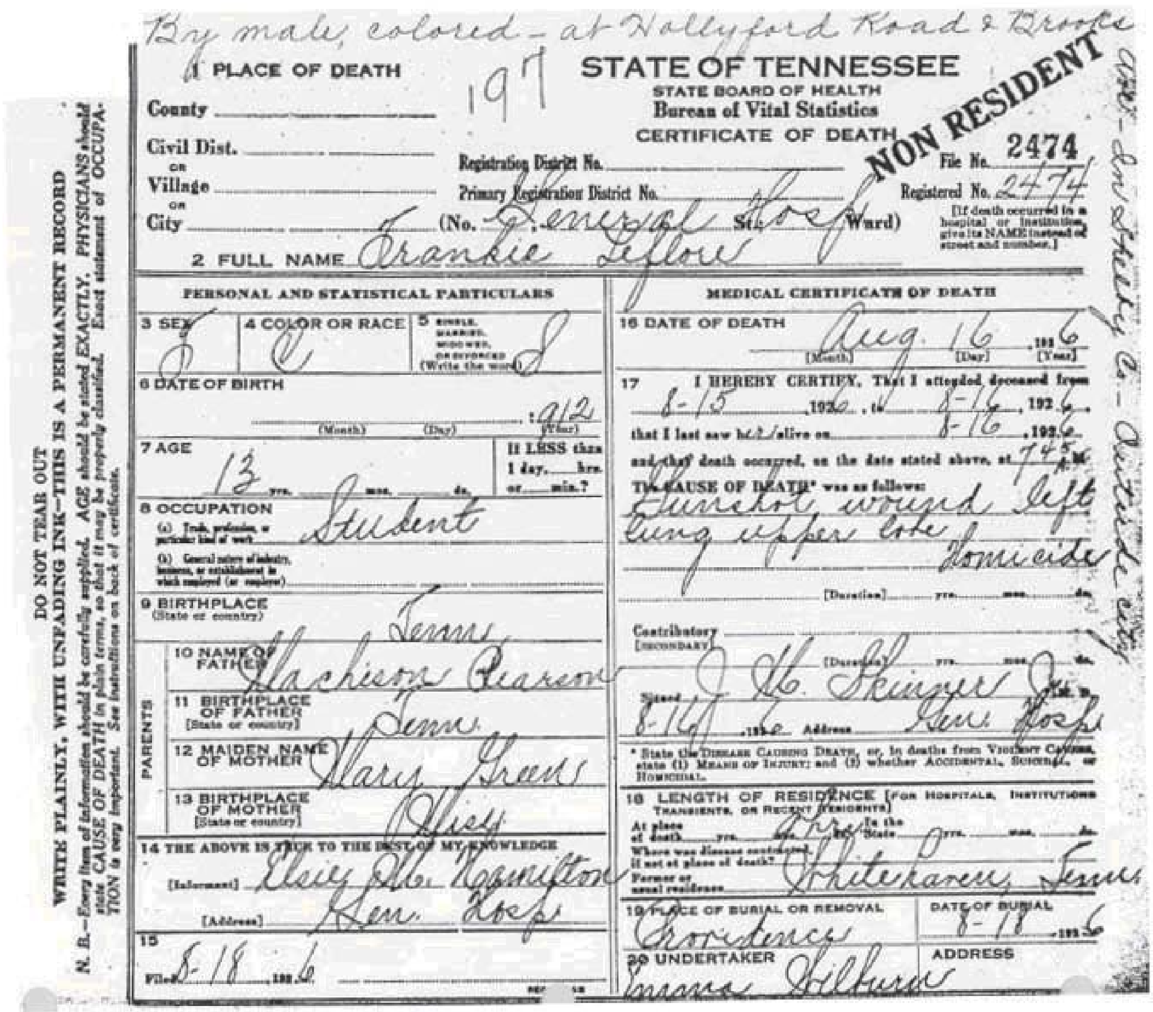
Funeral services will be held at the Providence Baptist Church near Hollyford Road and Brooks Avenue, Wednesday afternoon, Aug. 18 at 2 o'clock. Rev W. L. Ruebin will officiate, assisted by Rev J. G. Jackson. Interment in church cemetery. Emma Wilburn in charge. Funeral Home 913 Mississippi Boulevard, 3-0082



LEFLORE—Suddenly, on Hollyford Road, Monday morning, Aug. 16, 1926, Frankie Leflore, daughter of Madison and Mary Pearson, granddaughter of Frank and Tom Green, niece of O. C. John and Juaniter Green, Rosie Lee Moore and Limmie Cade of Indianola, Miss, cousin of Franklin B. and Jessie B. Green, niece of Allee Green, and leaves a host of other relatives and friends to mourn their loss.

Funeral services will be held at Providence Baptist Church, near Hollyford Road and Brooks Avenue, Wednesday afternoon, Aug. 18, at 2 o'clock. Rev. W. L. Ruebin will officiate, assisted by Rev. J. G. Jackson. Interment in church cemetery. Emma Wilburn in charge. Funeral home 913 Mississippi Boulevard. 3-0082.

Figure A.2: Newspaper clipping of Frankie LeFlore's obituary August, 1926. Courtesy of Weaver & Associates.


By male, colored - at Hollyford Road & Brooks Ave - In Shelby Co - Outside city

DO NOT TEAR OUT

WRITE PLAINLY, WITH UNFADING INK—THIS IS A PERMANENT RECORD

N. B.—Every item of information should be carefully supplied. AGE should be stated EXACTLY. PHYSICIANS should state CAUSE OF DEATH in plain terms, so that it may be properly classified. Exact statement of OCCUPATION is very important. See instructions on back of certificate.

1 PLACE OF DEATH

County

Civil Dist. or Village or City (No. General Hosp St. Ward)

197

STATE OF TENNESSEE

STATE BOARD OF HEALTH

Bureau of Vital Statistics

CERTIFICATE OF DEATH

NON RESIDENT

File No. 2474

Registration District No.

Primary Registration District No.

Registered No. 2474

[If death occurred in a hospital or institution, give its NAME instead of street and number.]

2 FULL NAME Frankie Leflore

PERSONAL AND STATISTICAL PARTICULARS

3 SEX F

4 COLOR OR RACE C

5 SINGLE, MARRIED, WIDOWED, OR DIVORCED (Write the word) S

6 DATE OF BIRTH (Month) (Day) (Year) 1912

7 AGE 13 yrs. mos. ds. IF LESS than 1 day, hrs. or min.?

8 OCCUPATION (a) Trade, profession, or particular kind of work Student (b) General nature of industry, business, or establishment in which employed (or employer)

9 BIRTHPLACE (State or country) Tenn

PARENTS

10 NAME OF FATHER Machison Pearson

11 BIRTHPLACE OF FATHER (State or country) Tenn

12 MAIDEN NAME OF MOTHER Mary Green

13 BIRTHPLACE OF MOTHER (State or country) Miss

14 THE ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE

(Informant) Elsie M. Hamilton

(Address) Gen. Hosp

15 Filed 8-18 1926

MEDICAL CERTIFICATE OF DEATH

16 DATE OF DEATH Aug. 16, 1926 (Month) (Day) (Year)

17 I HEREBY CERTIFY, That I attended deceased from 8-15, 1926, to 8-16, 1926, that I last saw her alive on 8-16, 1926, and that death occurred, on the date stated above, at 7:45 A.M.

The CAUSE OF DEATH* was as follows: Gunshot wound left lung upper lobe Homicide

(Duration) yrs. mos. ds.

Contributory (SECONDARY) (Duration) yrs. mos. ds.

Signed J. M. Skinner Jr.

8-16 1926 Address Gen. Hosp

* State the DISEASE CAUSING DEATH, or, in deaths from VIOLENT CAUSES, state (1) MEANS OF INJURY; and (2) whether ACCIDENTAL, SUICIDAL, or HOMICIDAL.

18 LENGTH OF RESIDENCE (FOR HOSPITALS, INSTITUTIONS, TRANSIENTS, OR RECENT RESIDENTS)

At place of death yrs. mos. ds. In the State yrs. mos. ds.

Where was disease contracted, if not at place of death?

Former or usual residence Whitehaven, Tenn

19 PLACE OF BURIAL OR REMOVAL Providence

DATE OF BURIAL 8-18 1926

20 UNDERTAKER Thomas Wilburn

ADDRESS

Figure A.3: Death Certificate for Frankie LeFlore. Her death certificate lists her as a 'colored female, single, and a student'. The cause of death was a gunshot wound to the left lung and was ruled a homicide.

Frank Green (Burial 21):

A newspaper was found in the suit jacket of this individual and was able to be dated to Wednesday, April 30, 1930.

Memphis Commercial Appeal obituary on Wednesday, April 17, 1926 reads:

GREEN- At residence, Hollyford Road, Monday morning, April 28, 1903, at 10 o'clock. Frank beloved husband of Mrs. Lue Green, father of Linnie Cade of Indianola, Miss., Mrs. Mary Preson, Mrs. Rosa Moore, Juanita and Willia Green of Durant Miss.; brother of Gus Green of Durant, Miss., 25 grandchildren and four great grandchildren; father-in-law of Mamie Green, Alice Madison Preson, and Alex Cade; uncle of Jessie, Beatrice, and Cora Love, and other relatives and friends to mourn their loss.

Remains will be above residence this evening after 6 o'clock. Funeral tomorrow afternoon at 3 o'clock from Providence Baptist Church, officiated by Revs J. C. Kempt, G. Jackson, and S. P. Morris, Interment in Church Cemetery. Orange Mound Undertaking Co. in charge. 2651 Carnes Avenue, Chas Jones, Mgr. phone 4-1642

The death certificate of this individual lists Frank Green as a colored male, 72 years old with a cause of death of bronchopneumonia.

Eliza Wyatt (Burial 30):

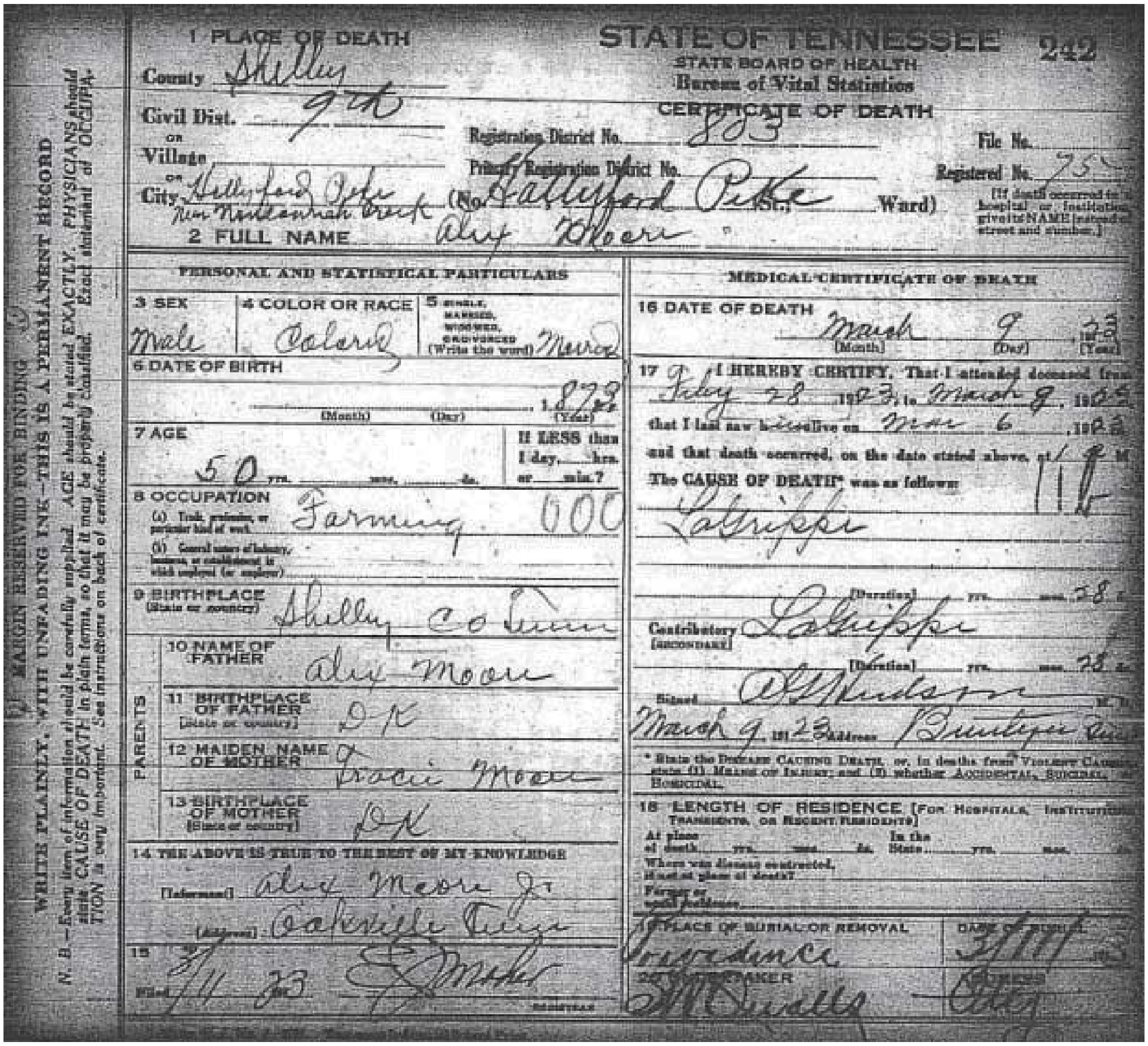
A newspaper fragment found under the remains of burial 30 provided a date and publication, Memphis *Commercial Appeal*, Wednesday, December 4, 1930. The Sunday edition lists Mrs. Eliza Wyatt in the obituary reading

WYATT—At the residence, Turrel, Ark., Nov 30, at 5 p.m., Mrs. Eliza Wyatt, devoted mother of Mr. George Wyatt of Turell, Ark., and Mrs. Annie Goodman of this city; grandmother of Mr. Primeus Whitmore, and Miss Lucille Wyatt of St. Louis, Mo.; a host of other relatives and friends to mourn their loss.

Funeral services will be held from Providence Baptist Church, Oakville, Tenn. This morning at 11 o'clock. The pastor in charge officiating. Interment church cemetery. Automobile service, Barnell & Spencer, funeral directors, 395 Florida Street, Phones 3-9225 and 3-5020.

Alex Moore:

Identified through archival research at the Memphis Shelby County Central Library.



STATE OF TENNESSEE 242
STATE BOARD OF HEALTH
Bureau of Vital Statistics
CERTIFICATE OF DEATH

1 PLACE OF DEATH
County Shelby
Civil Dist. 9th
or Village
or City Hollyford Pike Near Nonconnah Creek
Registration District No. 803
Primary Registration District No.
File No.
Registered No. 75
(No. Hollyford Pike St., Ward) (If death occurred in a hospital or institution, give its NAME instead of street and number.)
2 FULL NAME Alex Moore

PERSONAL AND STATISTICAL PARTICULARS
3 SEX Male
4 COLOR OR RACE Colored
5 SINGLE, MARRIED, WIDOWED, OR DIVORCED (Write the word) Married
6 DATE OF BIRTH (Month) (Day) 1873 (Year)
7 AGE 50 yrs. mos. ds. If LESS than 1 day, hrs. or min.?
8 OCCUPATION (a) Trade, profession, or particular kind of work Farming 000
(b) General nature of industry, business, or establishment in which employed (or employer)
9 BIRTHPLACE (State or country) Shelby Co Tenn
PARENTS
10 NAME OF FATHER Alex Moore
11 BIRTHPLACE OF FATHER (State or country) D K
12 MAIDEN NAME OF MOTHER Gracie Moore
13 BIRTHPLACE OF MOTHER (State or country) D K
14 THE ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE
(Informant) Alex Moore Jr
(Address) Oakville Tenn
15 Filed 3/11 23 Registrar

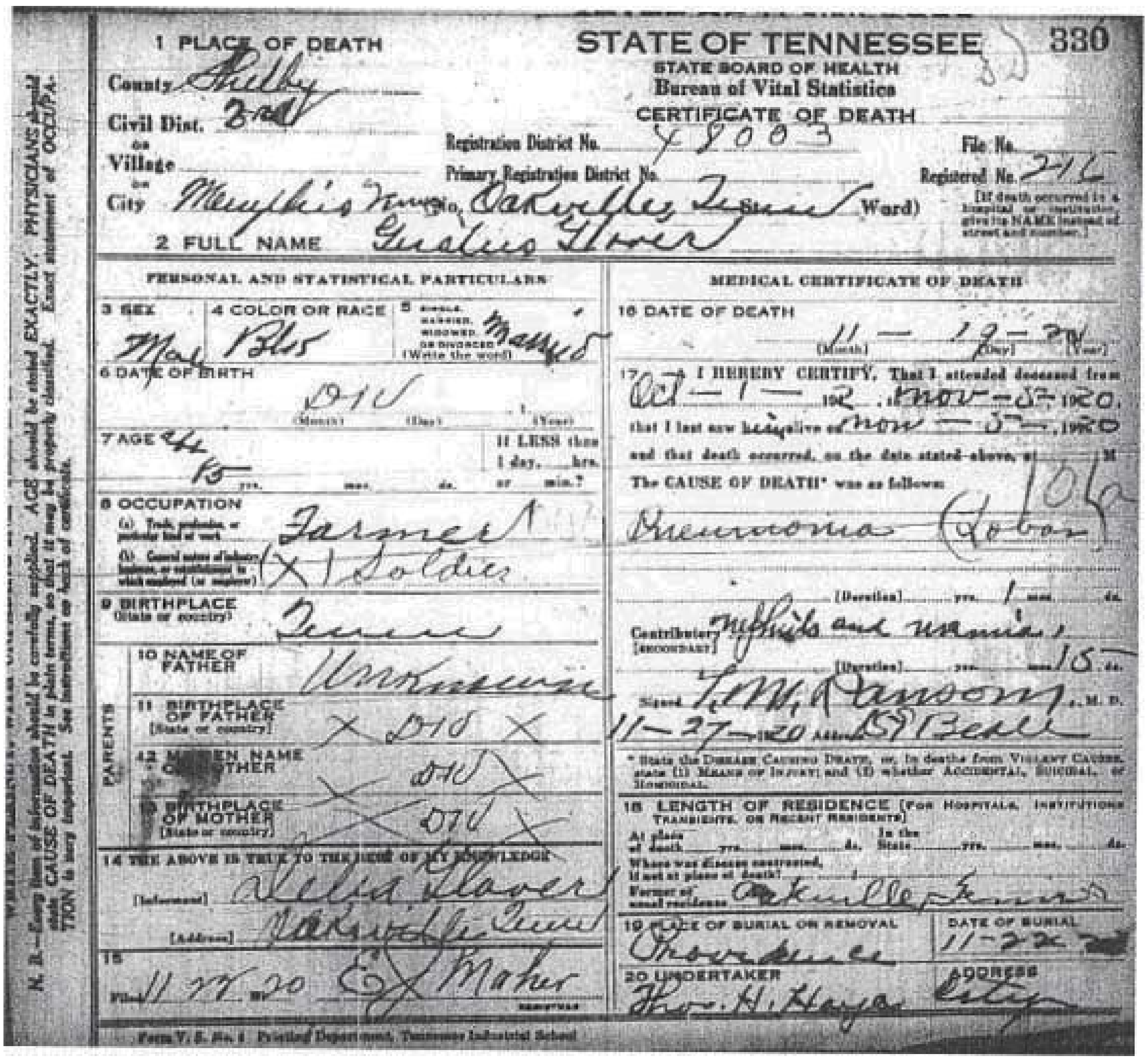
MEDICAL CERTIFICATE OF DEATH
16 DATE OF DEATH March 9 23 (Month) (Day) (Year)
17 I HEREBY CERTIFY, That I attended deceased from Feby 28 1923, to March 9 1923
that I last saw h alive on Mar 6 1923
and that death occurred, on the date stated above, at M.
The CAUSE OF DEATH* was as follows:
La Grippe
(Duration) yrs. mos. 28 ds.
Contributory (secondary) La Grippe
(Duration) yrs. mos. 28 ds.
Signed M.D.
March 9 1923 (Address)
*State the Disease Causing Death, or, in deaths from Violent Causes, state (1) Means of Injury; and (2) whether Accidental, Suicidal, or Homicidal.
18 LENGTH OF RESIDENCE (For Hospitals, Institutions, Transients, or Recent Residents)
At place of death yrs. mos. ds. In the State yrs. mos. ds.
Where was disease contracted, if not at place of death?
Former or usual residence
19 PLACE OF BURIAL OR REMOVAL Providence
DATE OF BURIAL 3/11 1923
20 UNDERTAKER
ADDRESS City

WRITE PLAINLY, WITH UNFADING INK—THIS IS A PERMANENT RECORD
MARGIN RESERVED FOR BINDING
N. B.—Every item of information should be carefully supplied. AGE should be stated EXACTLY. PHYSICIANS should state CAUSE OF DEATH in plain terms, so that it may be properly classified. Exact statement of OCCUPATION is very important. See instructions on back of certificate.

Figure A.4: Death certificate for Alex Green, a 50 year old male, died March 9, 1923.

Gustus Glover:

Identified through archival research at the Memphis Shelby County Central Library.


STATE OF TENNESSEE 330

STATE BOARD OF HEALTH

Bureau of Vital Statistics

CERTIFICATE OF DEATH

1 PLACE OF DEATH

County Shelby

Civil Dist. 3rd

Registration District No. 48003

Primary Registration District No.

File No.

Registered No.

City Memphis

2 FULL NAME Gustus Glover

PERSONAL AND STATISTICAL PARTICULARS

3 SEX Male

4 COLOR OR RACE Black

5 Married

6 DATE OF BIRTH

7 AGE 85 yrs.

8 OCCUPATION Farmer

(X) Soldier

9 BIRTHPLACE Tenn

10 NAME OF FATHER Unknown

11 BIRTHPLACE OF FATHER

12 MAIDEN NAME OF MOTHER

13 BIRTHPLACE OF MOTHER

14 THE ABOVE IS TRUE TO THE BEST OF MY KNOWLEDGE

(Informant) Delia Glover

(Address) Oakville Tenn

15 Filed 11 27 20 E J Maher Registrar

MEDICAL CERTIFICATE OF DEATH

16 DATE OF DEATH 11 — 19 — 20

17 I HEREBY CERTIFY, That I attended deceased from Oct — 1 — 19 to Nov — 3 — 1920,

that I last saw h alive on Nov — 3 — 1920

and that death occurred, on the date stated above, at M

The CAUSE OF DEATH* was as follows:

Pneumonia (Lobar)

Contributory (secondary)

Signed M.D.

11 — 27 — 20

18 LENGTH OF RESIDENCE

19 PLACE OF BURIAL OR REMOVAL Providence

DATE OF BURIAL 11-22

20 UNDERTAKER Thos. H. Hayes

ADDRESS City

Form V. S. No. 1 Printing Department, Tennessee Industrial School

Figure A.5: Death certificate for Gustus Glover, a 85 year old male, died November 19, 1920, from pneumonia.

Fraternal Organization Membership

Burial 21:

Figure A.6: Medallion on the jacket lapel of Burial 21, as it appeared in situ during excavation. Photograph courtesy of Weaver & Associates (2003).

Figure A.7: Museum replica of the Masonic organization medallion discovered on Burial 21 (Lettelier 2003).

Appendix B

Skeletal Analysis of the Providence Baptist Church Cemetery

Inventory

Each bone was coded by presence for the amount of pathological data that may be derived from the element.

Cranial bones are considered complete if over 75 percent of the surface is present. If the element is poorly preserved or highly fragmentary with less than 10 percent of the element present, the bone is considered absent, and the inventory is left blank.

Postcranial elements are inventoried in greater detail with articular surfaces evaluated separately. If more than 75 percent of the clavicle, sternum, sacrum, coccyx, patella, talus, and calcaneus are present, they are considered complete. The maximum length or width of the scapula must be measurable in addition to 75 percent of the element present for it to be complete. The ribs must have the head or neck with 75 percent of the shaft to be complete or have clearly identifiable and distinguishable shaft fragments present for it to be considered partial. The os coxae must have at least two of the following present to be considered complete: the auricular surface, pubic symphysis, and the acetabulum.

Vertebrae are coded based on the condition of the centrum, neural arch, and articular surfaces. For a vertebra to be complete it must have a centrum and either the superior or inferior articular surfaces. The completeness of vertebrae for sub-adults are based on the number of centra present.

Long bones are inventoried separately for diaphyses and articular surfaces. Each long bone is divided into proximal, middle, and distal sections. If at least 66 percent of the section is present, that section is considered complete. A section is absent when less than 33 percent of a section is present. Proximal and distal epiphyses are scored under the joint surface category.

All joint surfaces are scored as complete if over 50 percent of the joint surface is present and codable for pathology. The surface is scored as partial if there is less than 50 percent of the surface or if it is poorly preserved.

Coding Instructions for Inventory

Cranial Bones
1- complete
2- partial
3- blank-missing

Long Bones
1- complete
2- proximal 1/3 missing only
3- middle 1/3 missing only
4- distal 1/3 missing only
5- proximal 1/3 present only
6- middle 1/3 present only
7- distal 1/3 present only
blank - missing

Joint Surfaces
1- complete to 50% present
2- missing >50% of joint surface
blank - missing all of joint surface

Special Cases

Ribs 3rd-10th — Under left, right or single categories enter the number of bones present.

Vertebrae
C3-C6, T1-T9, L1-L5
Where applicable, under No Complete, enter the number of bones complete.

Blank - missing

Otherwise
1- complete
2- partial
blank - missing

Skeletal Inventory

COMPID:	
Site:	Date:
Feature:	Recorder:
Burial No:	

Sex:

Age:

Cranial Bones	Left	Right	Single
Frontal			_____
Parietal	_____	_____	
Occipital			_____
Temporal	_____	_____	
Zygomatic	_____	_____	
Maxilla	_____	_____	
Palatine	_____	_____	
Mandible			_____
Hyoid			_____
Postcranial Bones	**Left**	**Right**	**Single**
Sternum			
Manubrium			_____
Body			_____
Xiphoid			_____
Scapula	_____	_____	
Clavicle	_____	_____	
Innominate	_____	_____	
Sacrum			_____
Coccyx			_____
Patella	_____	_____	
Foot Bone			
Talus	_____	_____	
Calcaneus	_____	_____	

Long Bones	Left	Right
Humerus	_______	_______
Radius	_______	_______
Ulna	_______	_______
Femur	_______	_______
Tibia	_______	_______
Fibula	_______	_______

Joint Surfaces		
Temporomandibular	_______	_______
Humerus – Proximal	_______	_______
Humerus – Distal	_______	_______
Radius – Proximal	_______	_______
Radius – Distal	_______	_______
Ulna – Proximal	_______	_______
Ulna – Distal	_______	_______
Innominate – Acetabulum	_______	_______
Innominate – Sacroiliac	_______	_______
Femur – Proximal	_______	_______
Femur – Distal	_______	_______
Tibia – Proximal	_______	_______
Tibia – Distal	_______	_______

Ribs	Left	Right	No. Complete	
1^{st}	_______	_______		
2^{nd}	_______	_______		
3^{rd} – 10^{th}	_______	_______	_______	_______
11^{th}	_______	_______		
12^{th}	_______	_______		

Vertebrae	Single	
C1	_______	
C2	_______	
C3-C6	_______	_______
C7	_______	
T1-T9	_______	_______
T10	_______	
T11	_______	
T12	_______	
L1-L5	_______	_______
L1	_______	
L2	_______	
L3	_______	
L4	_______	
L5	_______	

Sex estimation

Sex estimation of complete skeletons are based on the pelvic and craniofacial morphology.

Visual assessment of the os coxae provides the most reliable indicators of sex (Krogman and Iscan 1986, Bass 1995). The pubis, ischiopubic ramus, subpubic angle, depth and width of the sciatic notch, and pre-auricular sulcus are the features used in the diagnosis sex (Phenice 1969). Overall muscle attachment robusticity and sexual dimorphism also were used in sexing the Providence Baptist Church series.

Sex estimation using cranial morphology relies on the relative size and robusticity of the nuchal lines, development of the superciliary arches, size of the mastoid processes, supra-orbital margin contour, and mental eminence (Bass 1995, Krogman and Iscan 1986, and Stewart 1979).

Sex is also based on postcranial metrics when the pelvic and cranial traits are missing or fragmentary. The overall size and robusticity of these elements can be used to identify sex. Post-cranial metrics also are applicable, especially the humeral and femoral head diameters and humeral epicondyle breadth (Bass 1995).

Sex estimation for sub-adults under the age of 15 is difficult because the secondary sex characteristics associated with puberty are incomplete. Unless obvious indicators of sex using the pelvis or cranium are apparent, sex estimation is not made for younger individuals. A few young adolescent individuals are sexed using circumstantial evidence, such as clothing and jewelry, discovered during the excavation process.

Age Estimation

Determination of age for individuals below the age of 25, are based on reference standards documenting the formation and development of the dentition and the skeleton. Dental mineralization provides one of the most accurate methods for age assessment in fetal, perinatal, and childhood remains (Moorrees et al 1963a, 1963b, Ubelaker 1989). The determination of childhood age using dental development is based on the standards documenting the formation of teeth (Moorrees et al 1963a, 1963b, Harris and McGee 1990, and Liversidge et al. 1998) The growth of long bones; epiphyseal appearance, development, and union; and specific aspects of skeletal development provide additional indicators of age for sub-adult individuals (Scheuer and Black 2000, Fazekas and Kosa 1978, Redfield 1970, Krogman and Iscan 1986).

Age determination for adults aged 25 or over is based on morphology and degenerative age related changes. All available skeletal indicators were used to assign an age range to individuals. Methods developed from the degenerative changes of os coxae are the primary indicators of age utilized. These standard methods are based on scoring the age-related degenerative changes of the pubic symphysis and auricular surface morphology of the os coxae (Brooks and Suchey 1990, Lovejoy et al. 1985). Supplemental methods include epiphyseal closure, fusion of the cranial sutures, dental attrition, degenerative joint disease, and loss of bone density (Krogman and Iscan 1986, Lovejoy et al. 1985, and Meindl and Lovejoy 1985). Whenever an individual cannot be assigned to a specific age range, due to preservation and/or lack of available indicators, the individual is assigned into the general age categories of young adult (<35) and old adult (>35).

Ancestry Estimation

Ancestry estimation is based predominantly on craniofacial morphology and craniometric discriminant functions. Morphological characteristics of the cranium examined to indicate ancestry include orbital shape; interorbital breadth; the width and shape of the nasal aperture; presence of nasal guttering; and cranial shape (Gill 1984, 1998, Gill and Rhine 1986, Rhine 1990). The dentition also indicates biological affiliation through the degree of alveolar prognathism and crenulation of molars. When preservation permitted, craniometric analysis using DISPOP, a multivariate discriminant function program based on Mahalanobis distances and posterior probabilities, is used (Jantz 2000).

Stature

Maximum long bone measurements were taken of the humerus, radius, ulna, femur, tibia, and fibula as defined by Moore-Jansen et al. (1994) and Zobeck (1983).

Stature estimations were completed using Trotter and Gleser (1952) regression equations for American Blacks developed using the Terry collection. Only those individuals with elements sufficiently complete were used.

Bone Pathology

After the completion of the skeletal inventories all bones were examined macroscopically for pathology including pathological lesions, degenerative joint disease, and trauma. Radiographs were taken when necessary to identify specific pathology.

Pathological changes were scored using the Smithsonian Institution Coding System, developed by Owsley et al. (1990), detailing the type, location, severity, state, and extent of a lesion.

The diagnosis of pathological conditions relied on several references (Steinbock 1976, Mann and Murphy 1990, Buikstra and Ubelaker 1994, Aufderheide et al. 1998, Ortner 2002).

Degenerative joint disease changes were scored in relation to the presence and severity of osteophytes, porosity, and eburnation for each specific articular surface. Categories were derived from Ortner (1968), Jurmain (1975), and Palkovich (1978).

Trauma was recorded in a similar fashion. Postcranial fractures are coded by bone, location on the bone, severity, and state (Galloway 1999). Cranial fractures of the cranial vault bones (i.e., frontal, parietal, temporal, and occipital bones) were coded for the shape, size, severity, and state of the fracture. Fractures of the maxillae, zygomatics, and mandible were coded for presence and state. Radiographs of all fractures were taken and in certain circumstances illustrated on anatomical drawings documenting the location, shape, and measurements.

Skeletal Pathology Coding Sheet
D. W. Owsley

Bone Cell Response
1) Bone Loss
2) Bone Formation
3) Bone Loss and Formation

Classification

1) Bone Loss	1) Resorptive lesion (lytic) 2) Bowing (rickets, disuse) 3) Porosis (pinpoint to coalesced) 4) Osteopenia/osteoporosis
2) Bone Formation	1) Increased density/sclerosis (x-ray) 2) Periostitis 3) Osteomyelitis (medullary involved or sinus formation) 4) Neoplasm (tumor) 5) Ossified cartilage 6) Ossified connective tissue (ectopic bone, enthesopathy, myositis ossificans)
3) Bone Loss and Formation	1) Bone loss and formation

Severity
1) Mild
2) Moderate
3) Severe

Remodeling (State)
1) Active
2) Healed

Involvement
1) Localized
2) Widespread

Location (Long bones only)

1) Proximal 1/3 shaft
2) Middle 1/3 shaft
3) Distal 1/3 shaft
4) Distal joint
5) Proximal joint
6) Proximal tuberosity
7) Distal tuberosity
8) More than one of the above

Location (other bones)

Frontal	1) Endocranial
Parietal	2) Ectocranial
Occipital	3) Both
Manubrium	1) Ventral surface
	2) Dorsal surface
	3) Both
Vertebrae	1) Centrum
	2) Arch
	3) Both
Innominates	1) External surface of ilium
	2) Internal surface of ilium
	3) Both 1 and 2
	4) Acetabulum
	5) Pubic Bone (dorsal pits, etc.)
	6) Symphysis
	7) Ischium
Sacrum	1) Ventral surface
	2) Dorsal surface
	3) Articular surface
	4) Promontory
	5) Both 1 and 2

Skull Fracture

Shape/ Characteristics	1) Blunt round 2) Blunt ovoidal 3) Edged (bladed) 4) Crushing 5) Projectile
Radiating Fractures	1) Present 2) Absent
Severity	1) Ectocranial 2) Endocranial

Maximum diameter (mm)
Minimum diameter perpendicular to above measurement
Number (count of separate blows per bone)

Postcranial Fracture

	1) Perimortem (occurred at or near death) 2) Periostitis/callus formation 3) Osteomyelitis 4) Pseudoarthrosis (incomplete/malunion)
Severity	1) Incomplete 2) Complete
Remodeling	1) No healing 2) Healing 3) Healed
Location	1) Proximal 1/3 shaft 2) Middle 1/3 shaft 3) Distal 1/3 shaft 4) Distal joint 5) Proximal joint 6) Proximal tuberosity 7) Distal tuberosity 8) More than one of the above

Vertebral Body Fracture

1) Compression (any body fracture-nonpathological such as from a fall)
2) Single endplate depression (disc) without wedging- usually degenerative
3) Single endplate depression (disc) with wedging- usually degenerative
4) Wedged (congenital/idiopathic only)
5) Biconcave bodies (with or without wedging-reflects osteoporosis and osteomalacia)
6) More than one of the above

Schmorl's Depressions

Number of thoracic bodies affected
Number of lumbar bodies affected

Spinal Anomalies

1) Spina bifida (includes cleft spine)
2) Spondylolysis
3) Both

Sacral Anomalies

1) Spina bifida (included cleft spine)

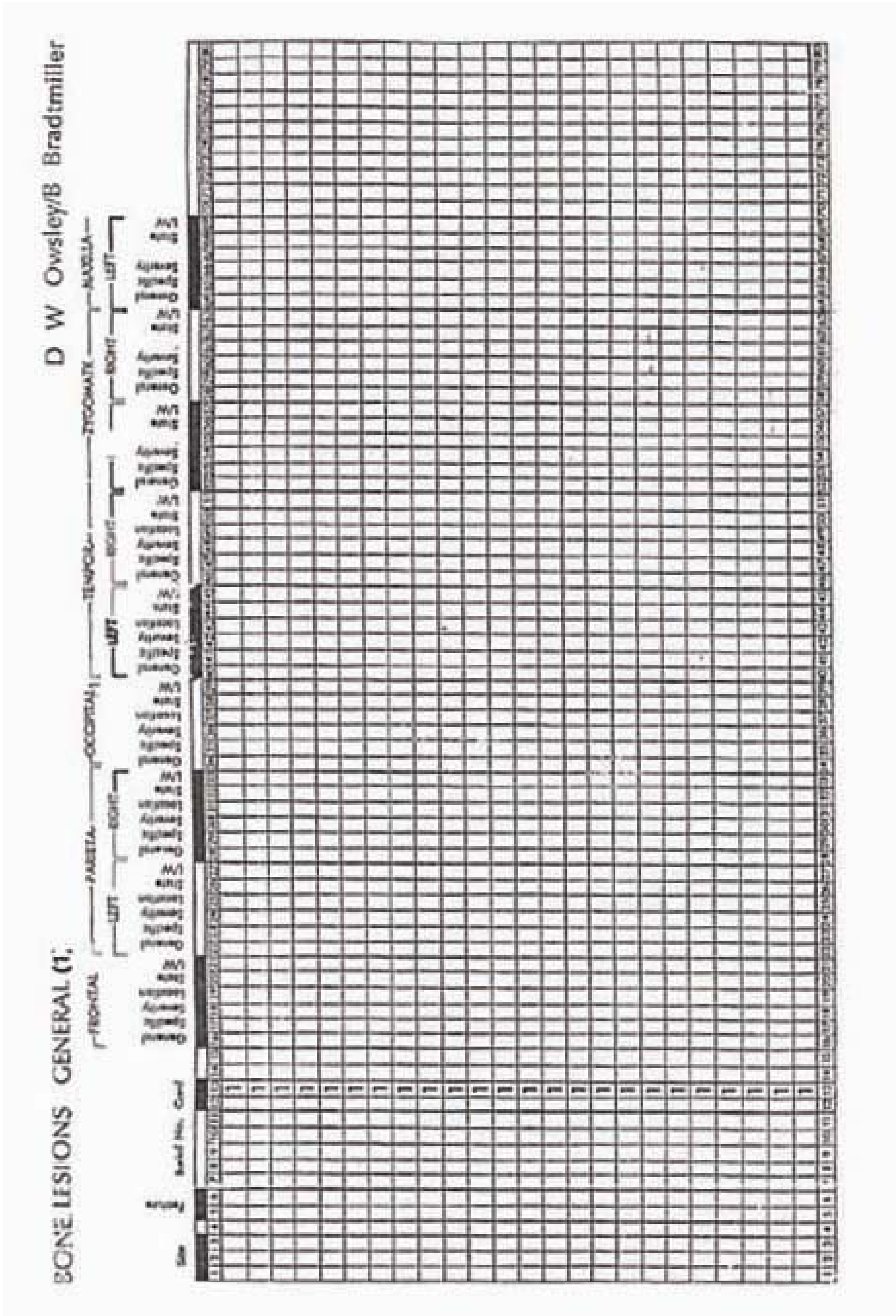
Degenerative Joint Disease (Arthritis)

Osteophyte Formation
Porosis (pitting)
Eburnation (polishing)

Severity	1) Mild 2) Moderate 3) Severe 4) Ankylosis (osteophytes only)
Location (joint/facet)	1) Surface (subchondral bone) 2) Margin (periphery without encroachment of subchondral bone) 3) Both
Location (vertebral body)	1) Endplate (superior/inferior) 2) Margin (periphery only) 3) Both

Diagnostic Codes

Syphilis	
Tuberculosis	1 = present
Traumatic death	
Projectile (present or was present)	
Dislocation (luxation or subluxation)	
Osteoporosis (generalized bone loss or Radiographic loss also)	
Porotic hyperostosis	1 = mild
Cribra Orbitalia	2 = moderate
	3 = severe


BONE LESIONS GENERAL CR.

D W Owsley/B Bradtmiller

Figure A.8: Skeletal Pathology Coding Forms, page 1.

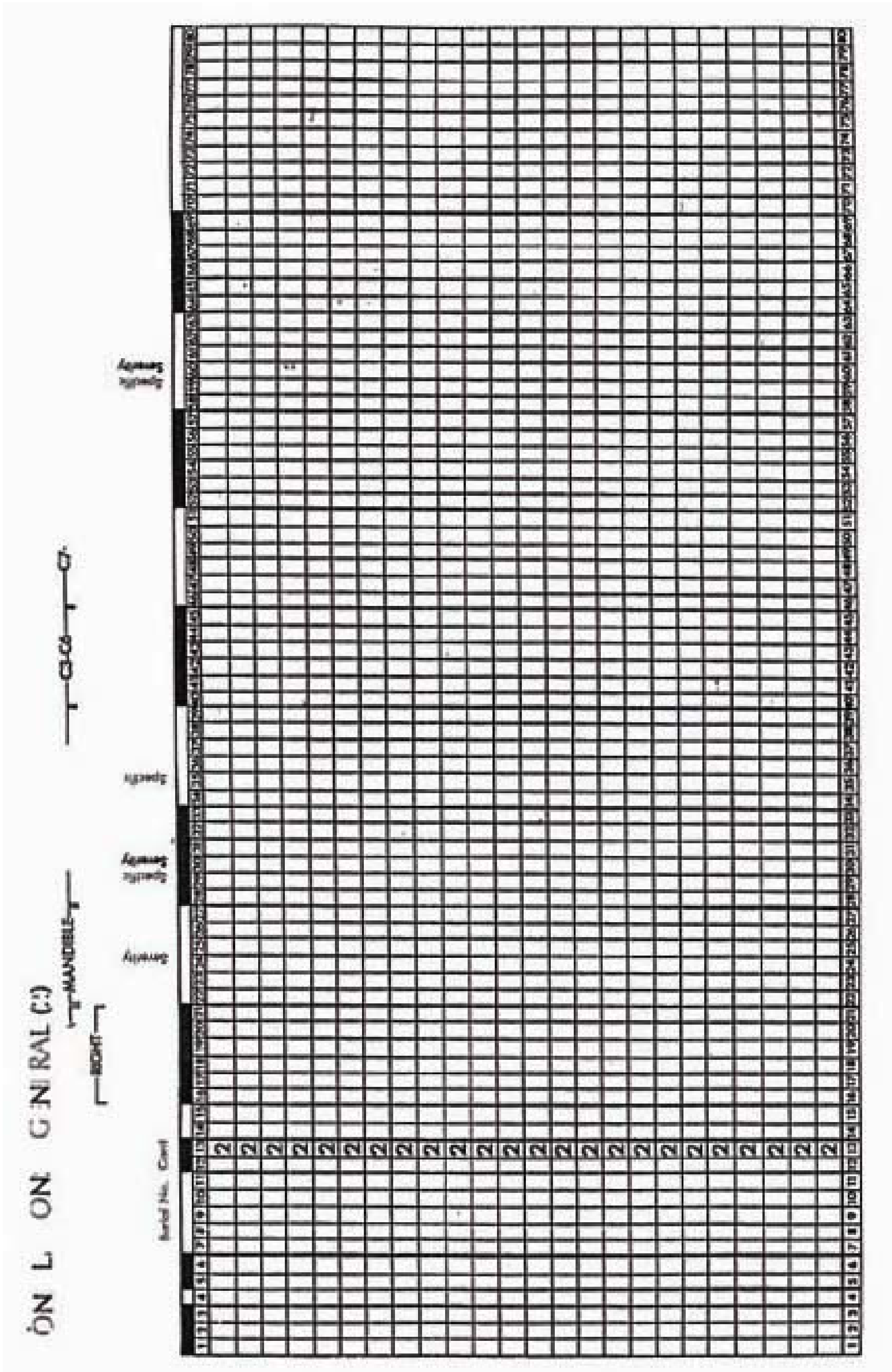


Figure A.9: Skeletal Pathology Coding Forms, page 2.

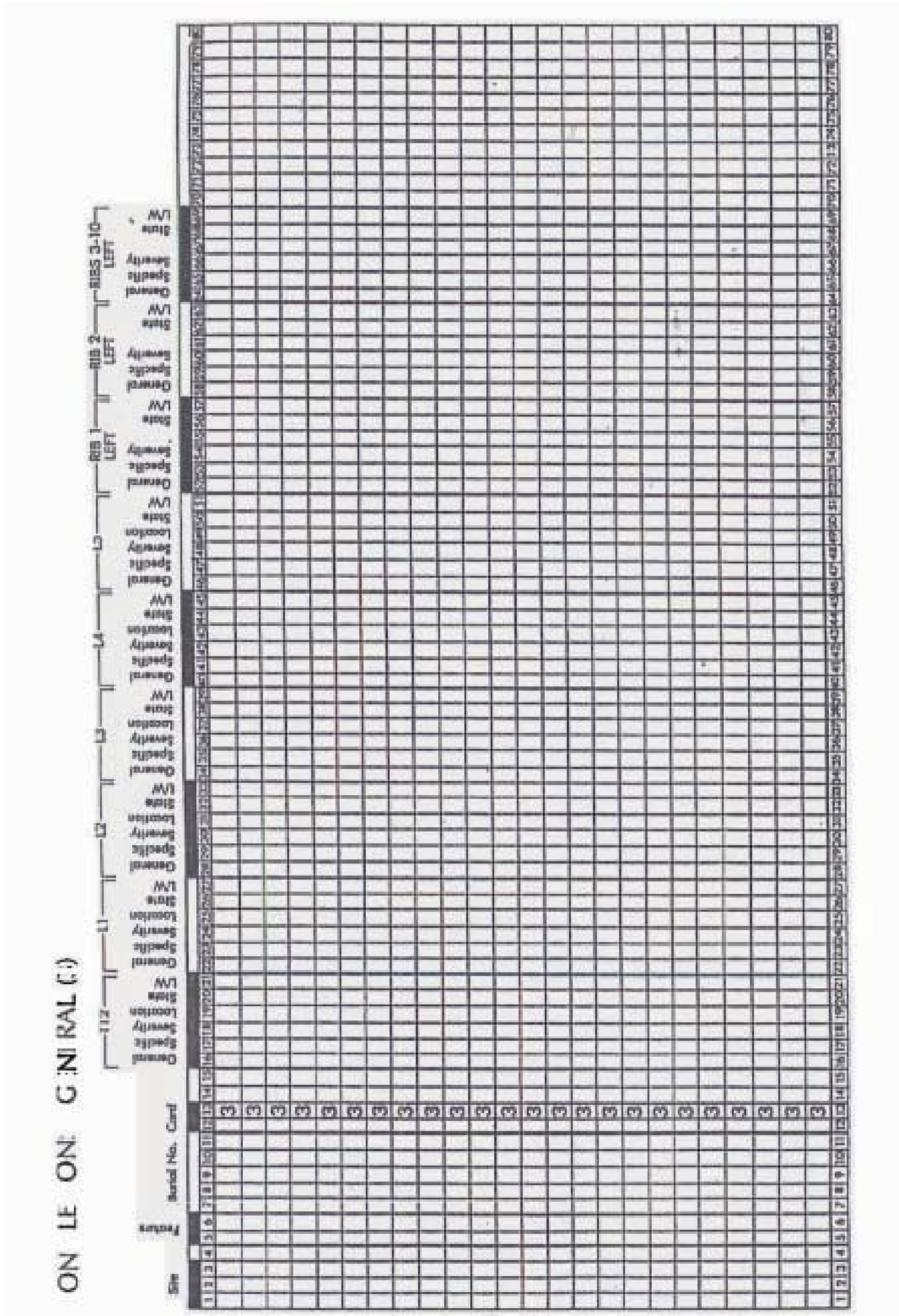


Figure A.10: Skeletal Pathology Coding Forms, page 3.

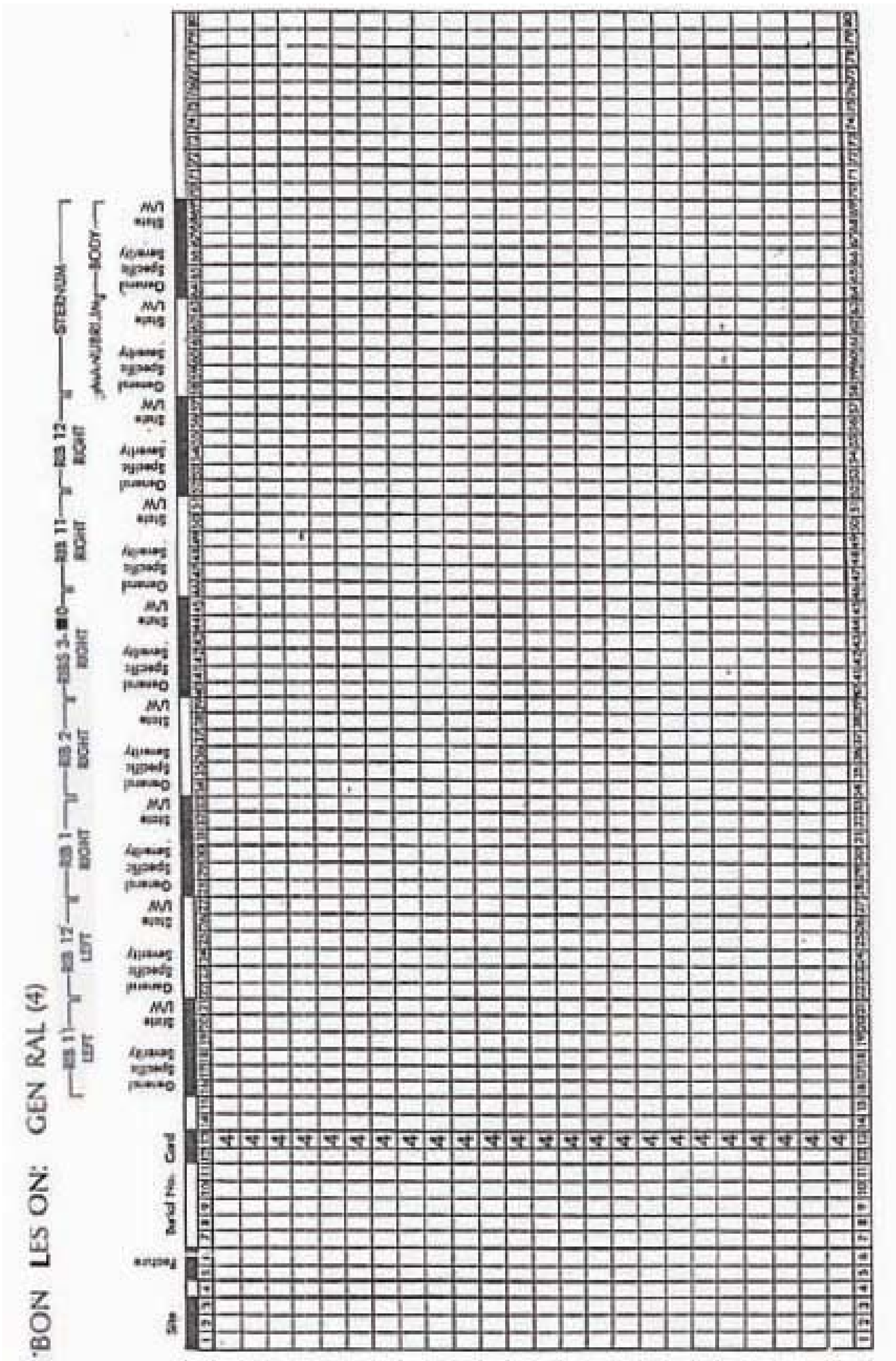


Figure A.11: Skeletal Pathology Coding Forms, page 4.

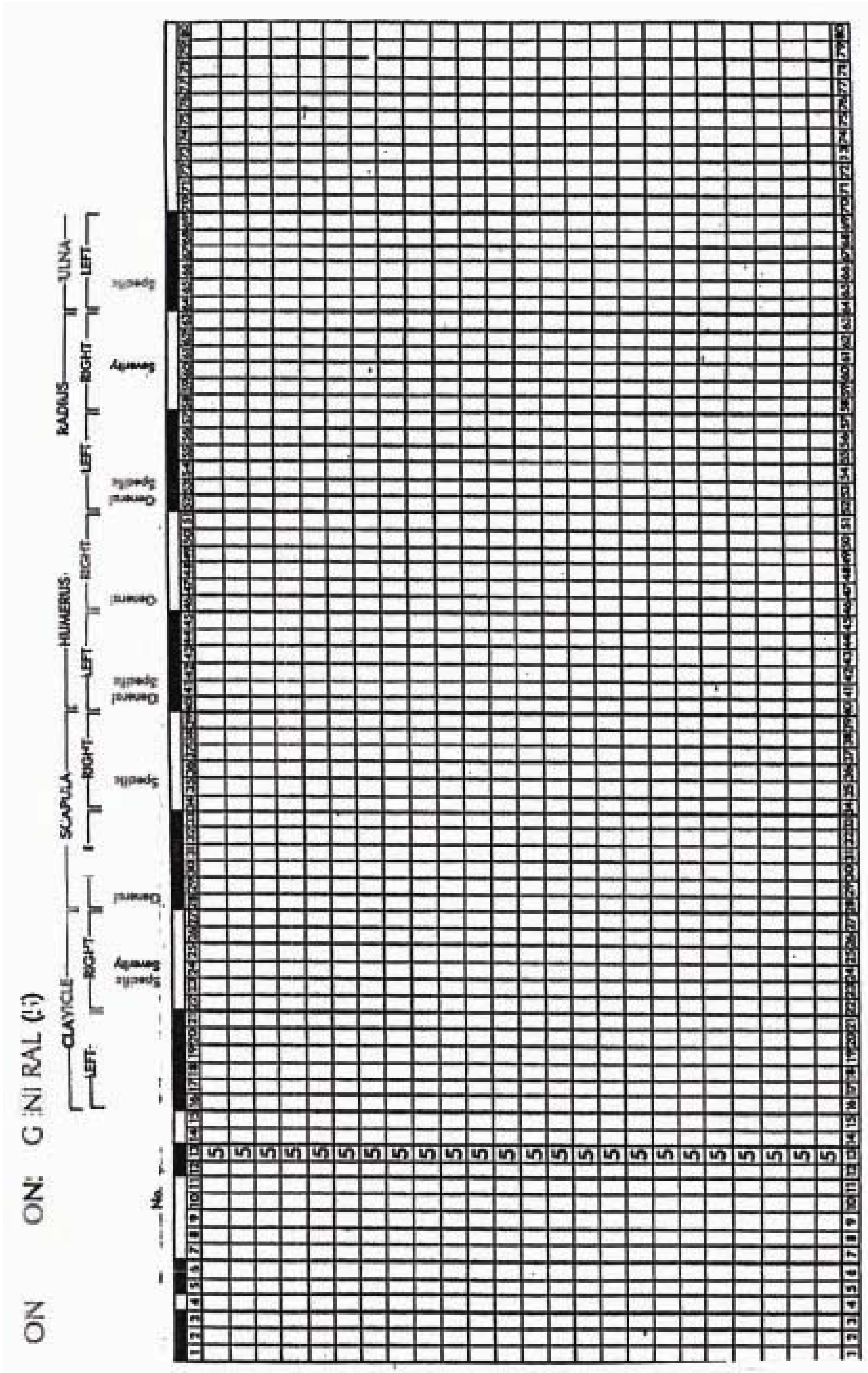


Figure A.12: Skeletal Pathology Coding Forms, page 5.

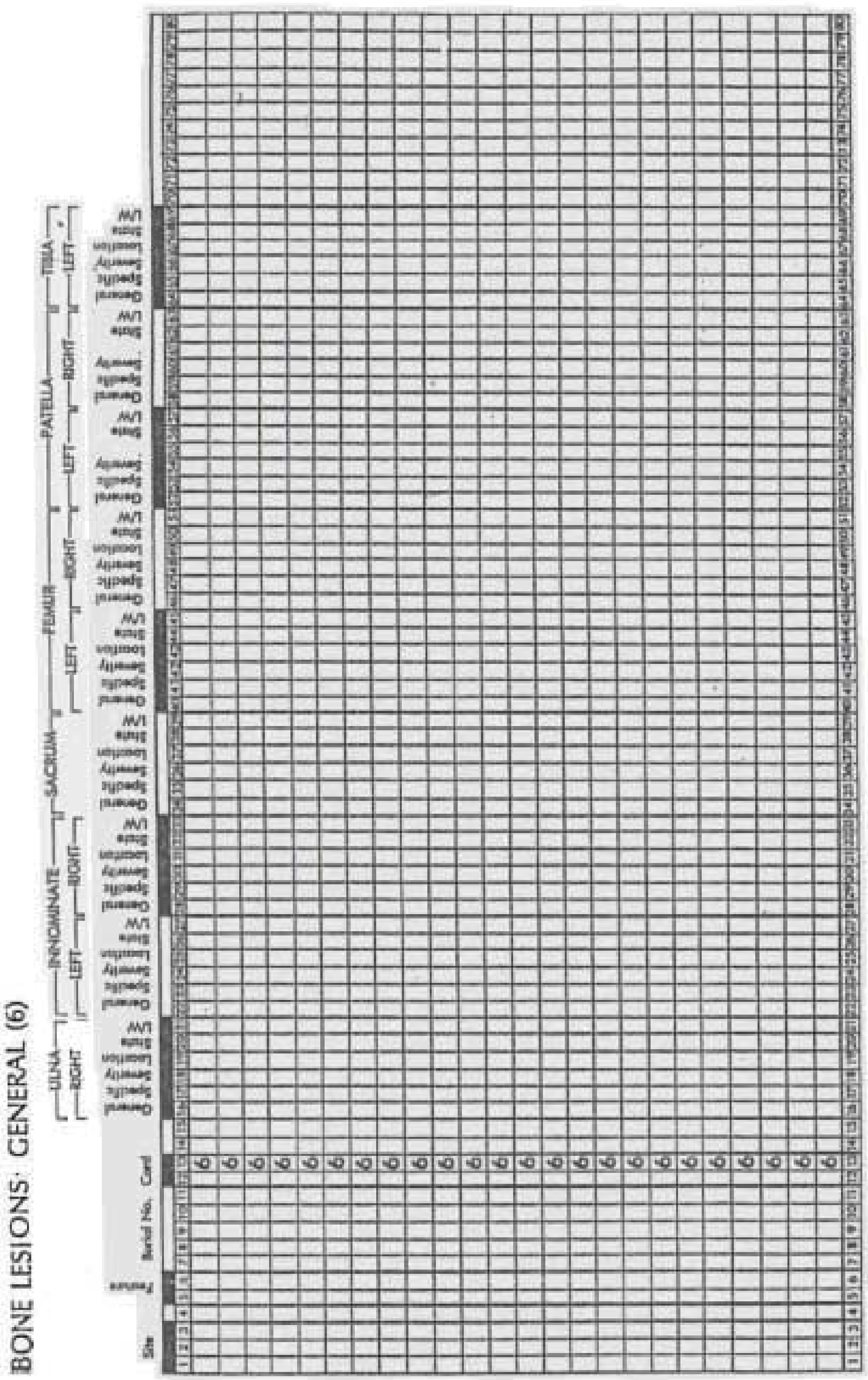


Figure 4: A.13 Skeletal Pathology Coding Scheme, page 6.

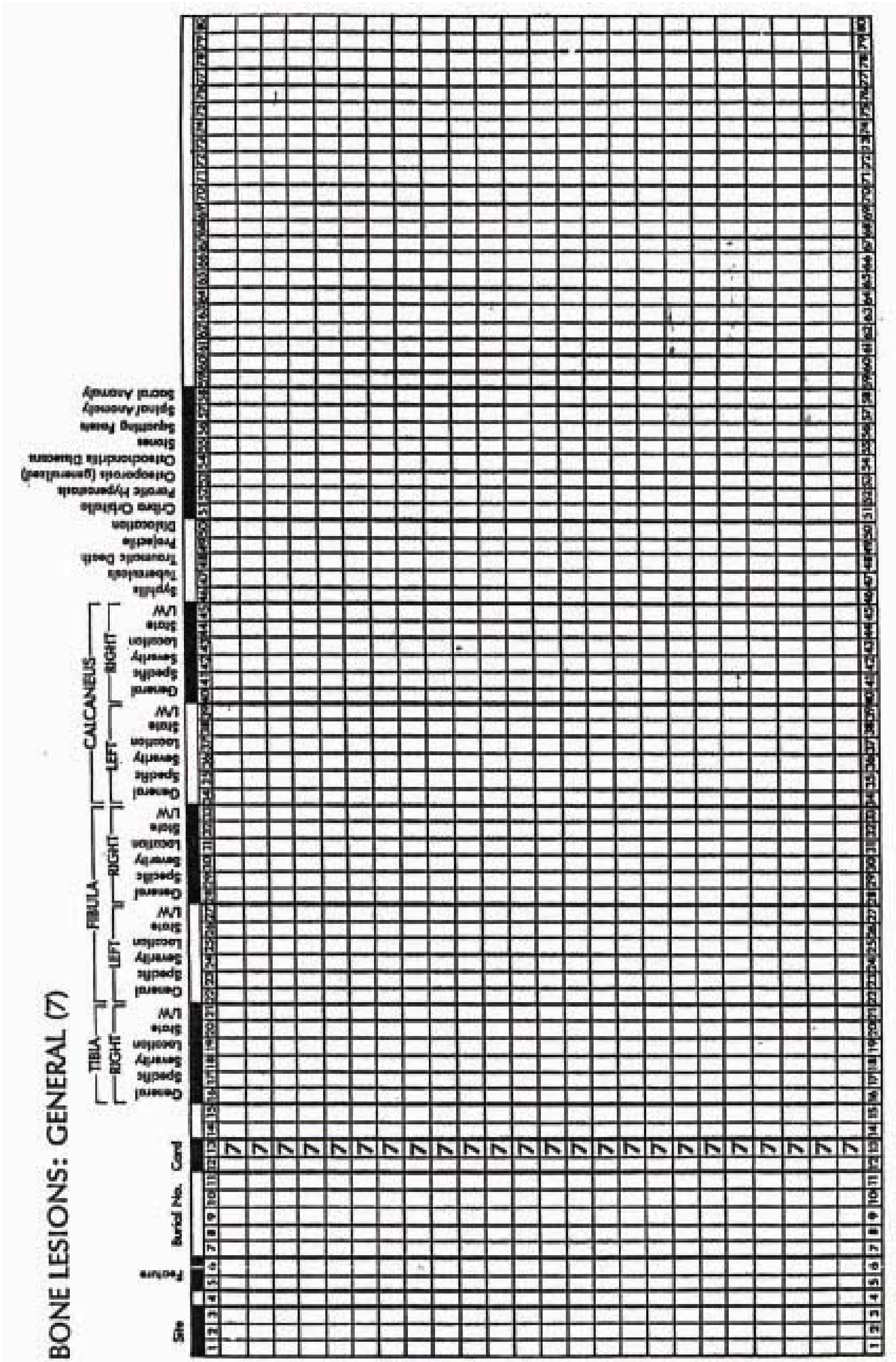


Figure A.14: Skeletal Pathology Coding Forms, page 7

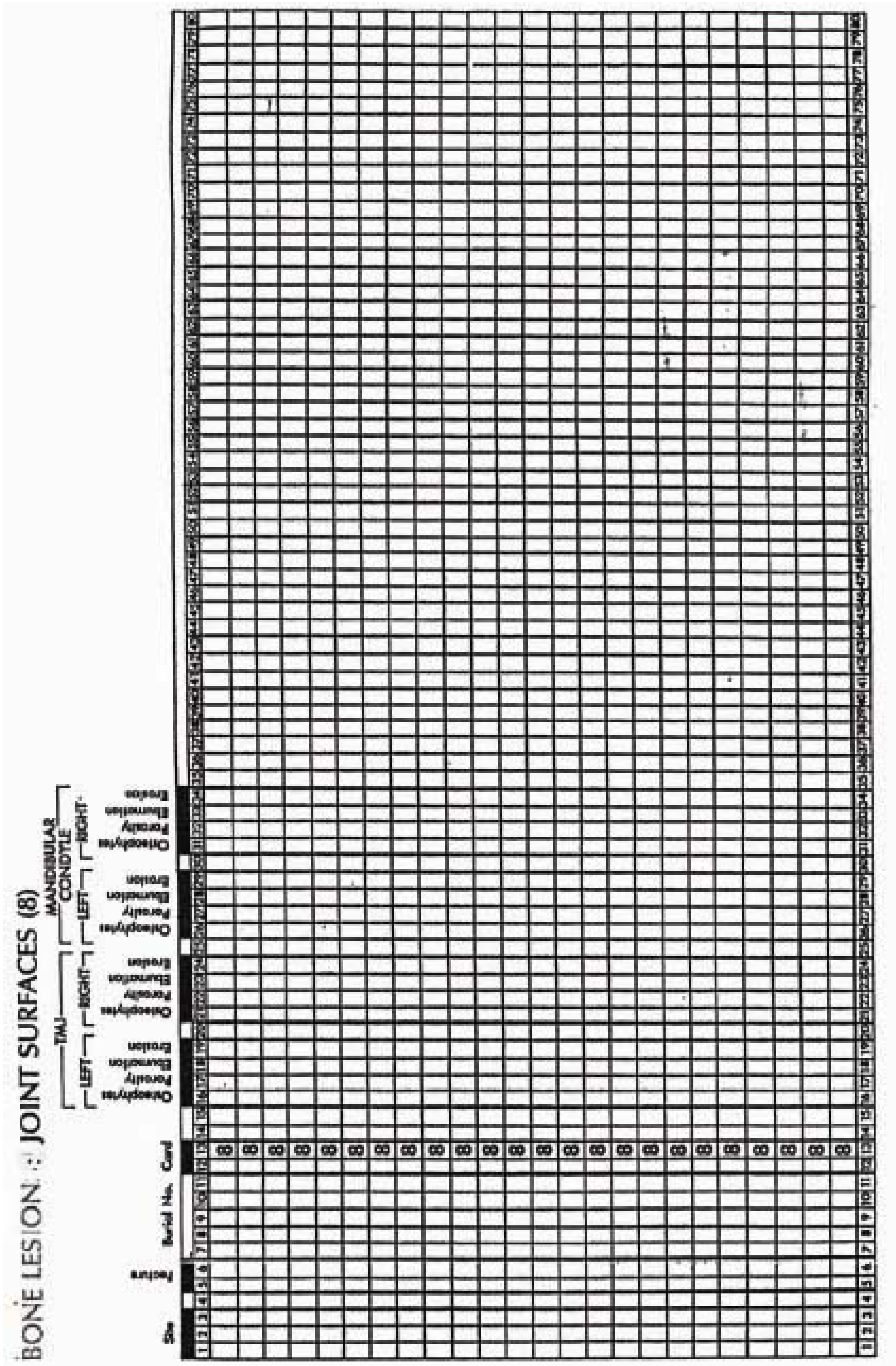


Figure A.15: Skeletal Pathology Coding Forms, page 8.

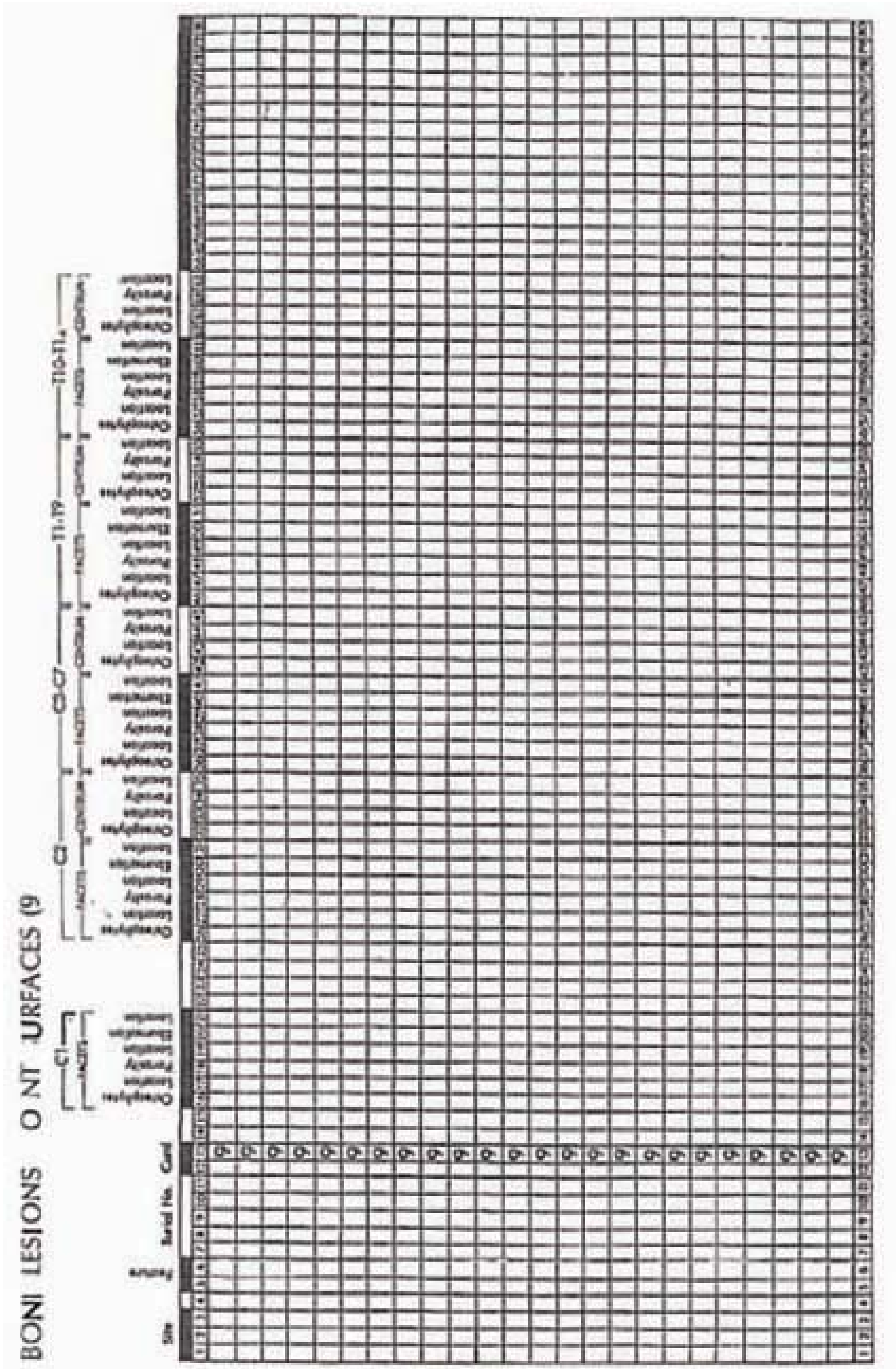


Figure A.16: Skeletal Pathology Coding Forms, page 9.

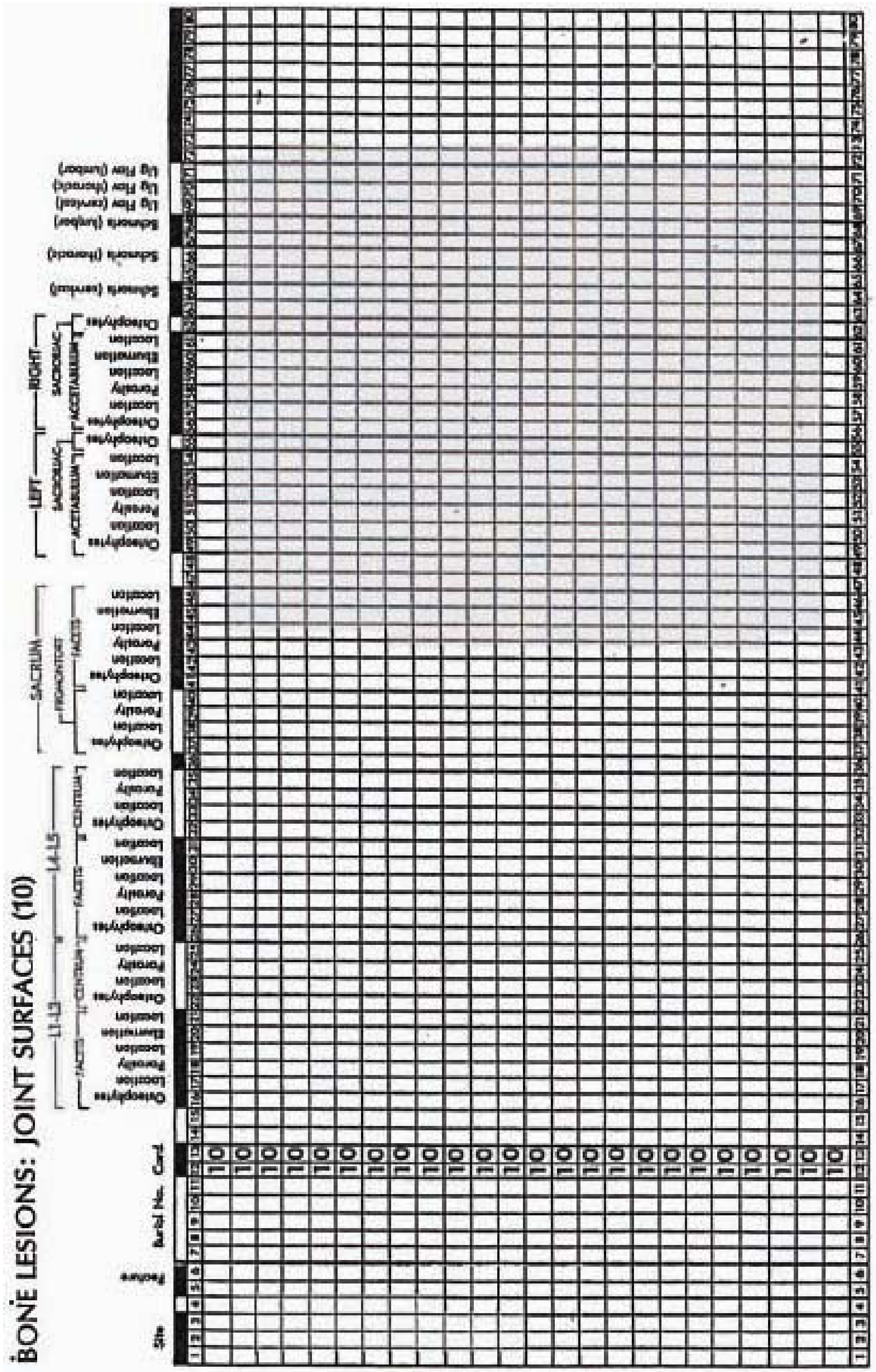
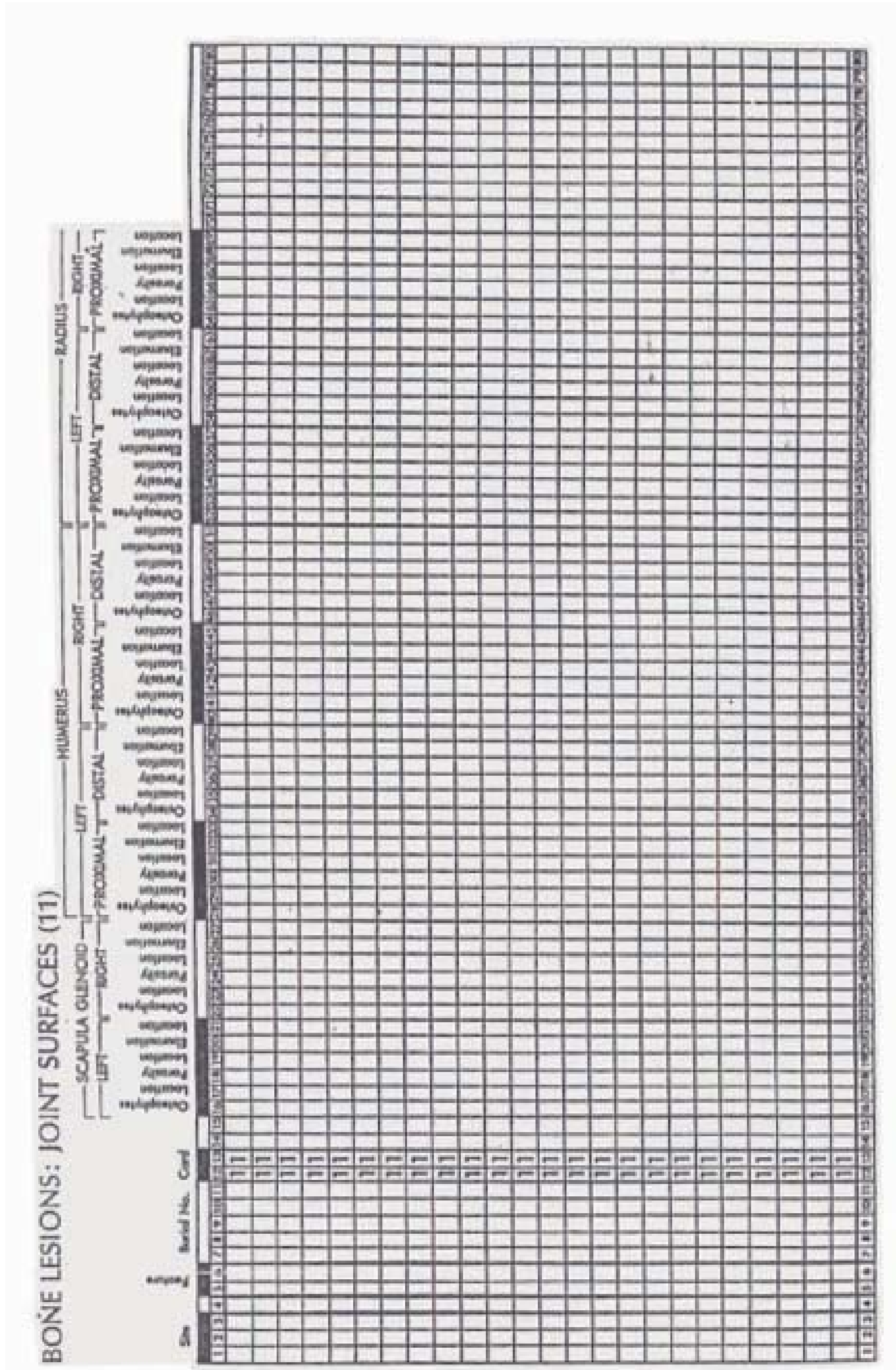


Figure A.17: Skeletal Pathology Coding Forms, page 10.



BONE LESIONS: JOINT SURFACES (11)

Site | Feature | Burial No. | Card

SCAPULA GLENOID — LEFT — RIGHT

HUMERUS — LEFT — PROXIMAL — DISTAL — RIGHT — PROXIMAL — DISTAL

RADIUS — LEFT — PROXIMAL — DISTAL — RIGHT — PROXIMAL

Osteophytes | Location | Porosity | Location | Eburnation | Location

Figure A.18: Skeletal Pathology Coding Forms, page 11.

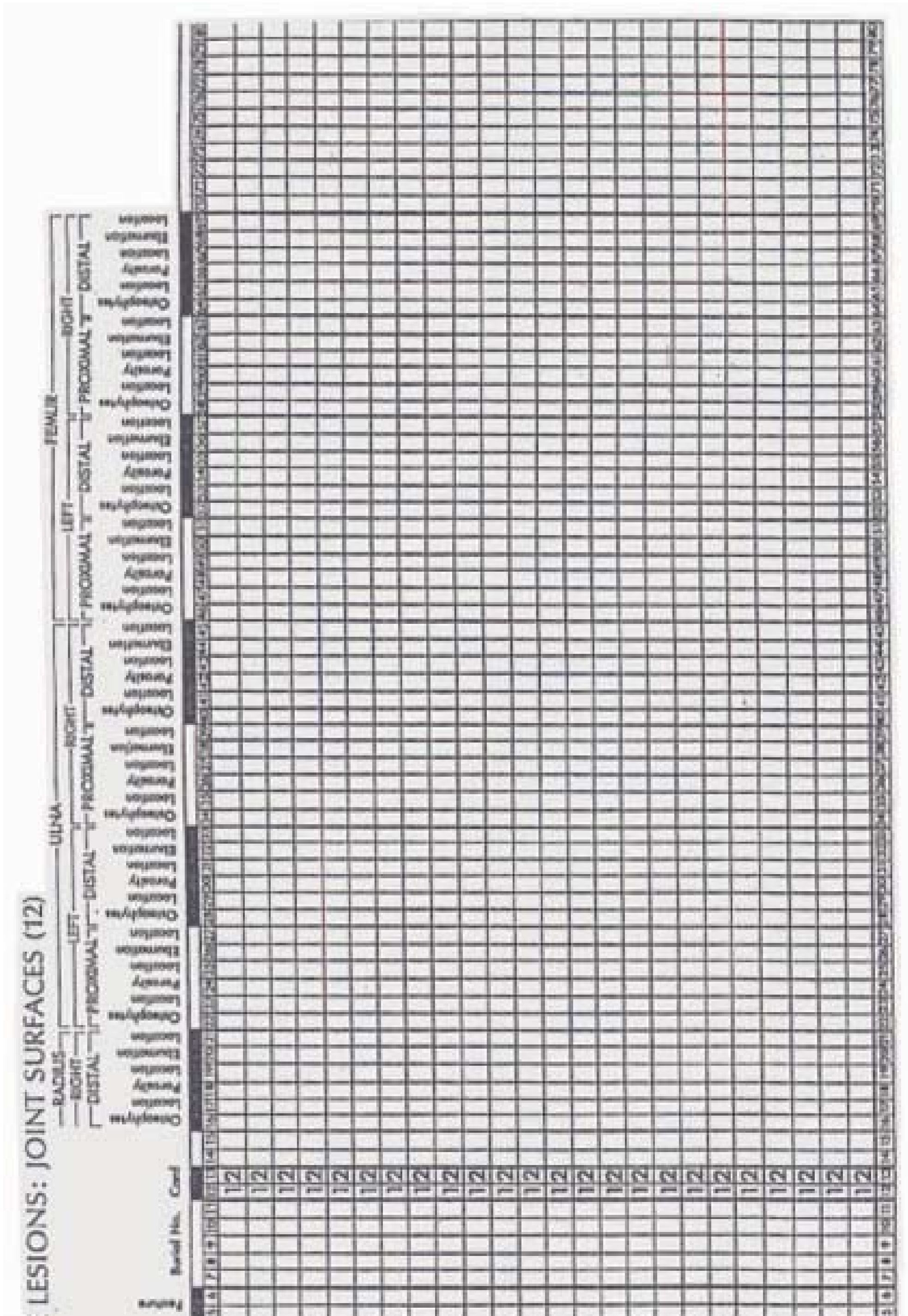


Figure A.19: Skeletal Pathology Coding Forms, page 12.

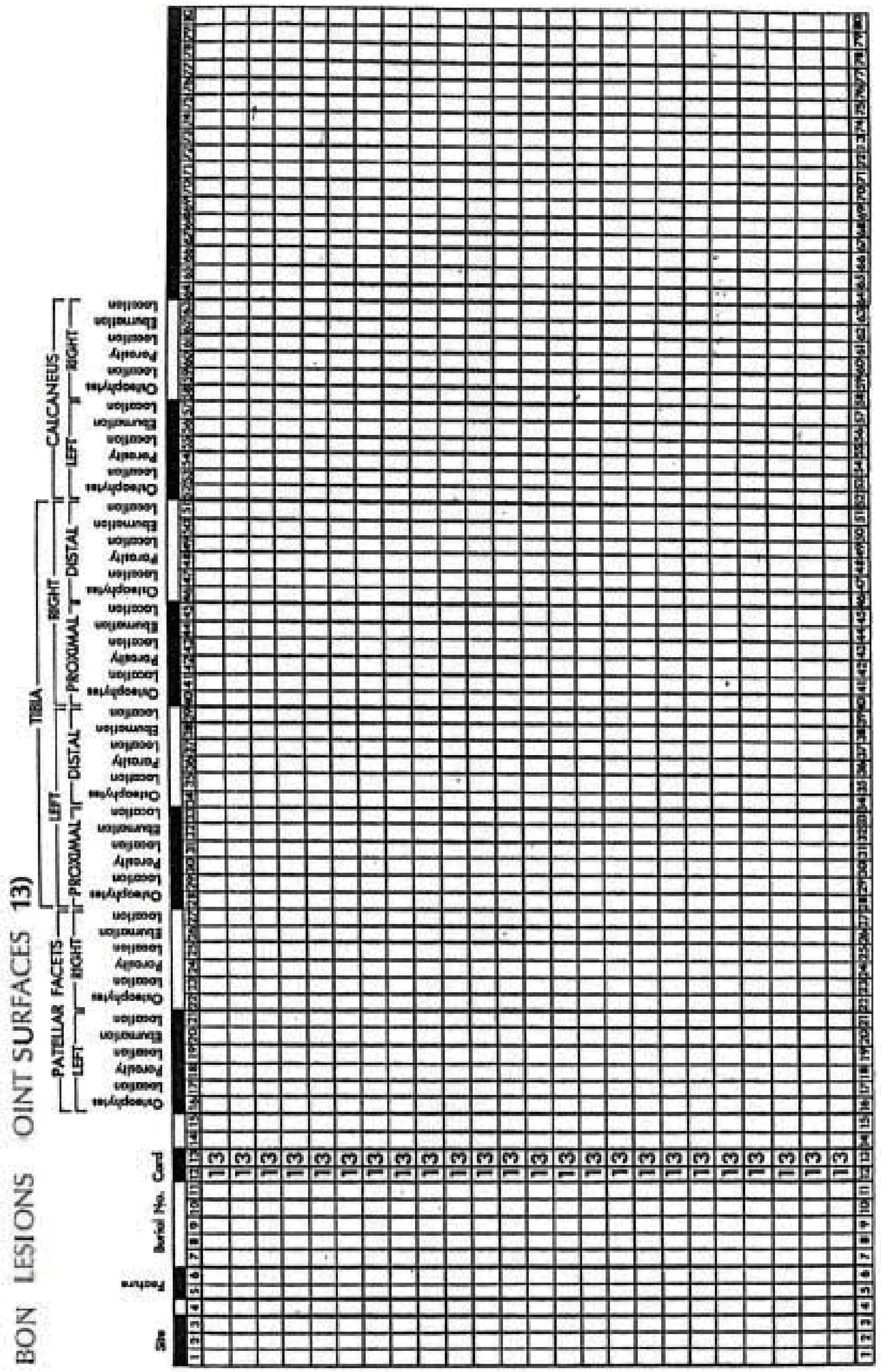


Figure A.20: Skeletal Pathology Coding Forms, page 13.

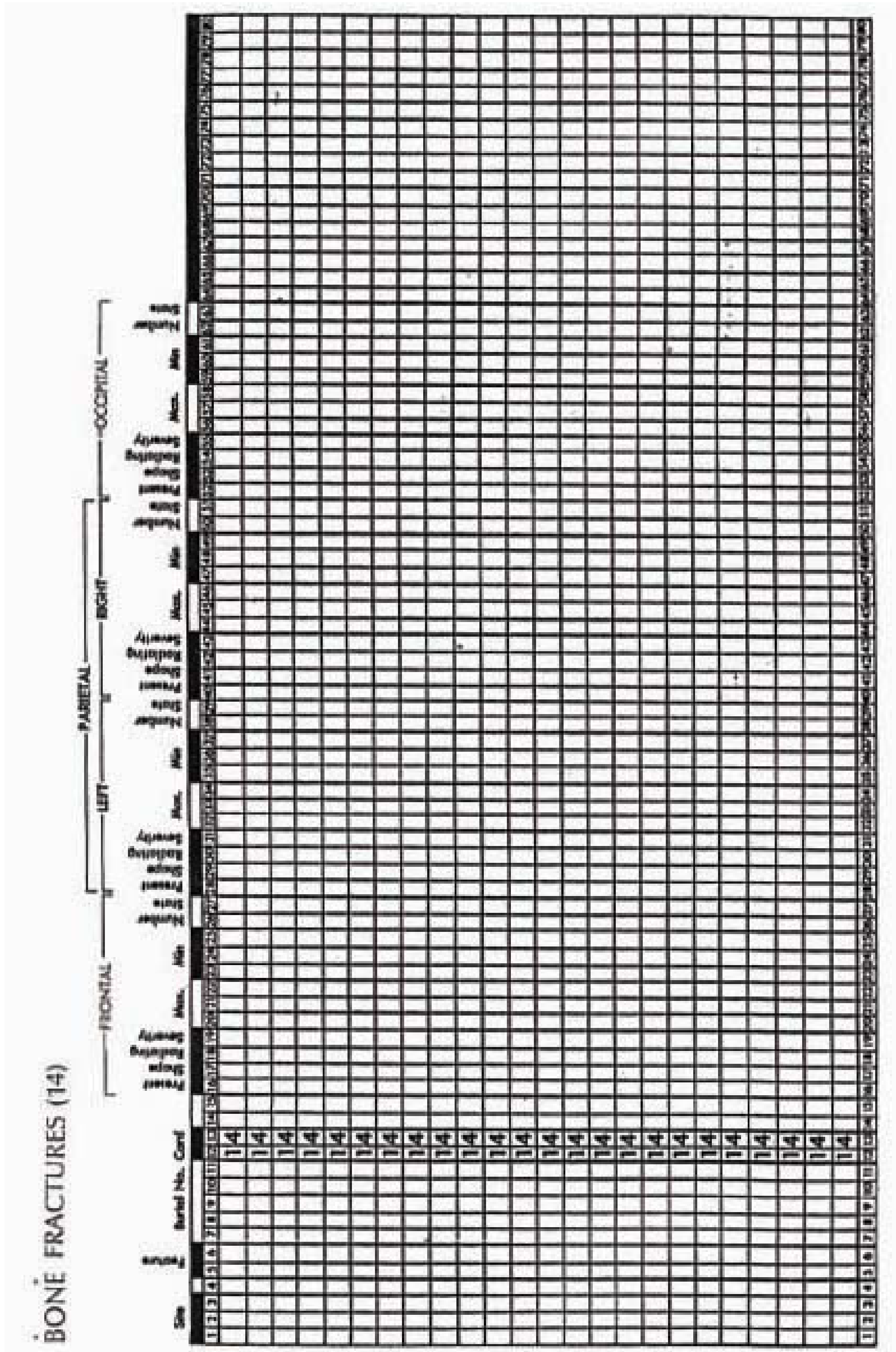


Figure A.21: Skeletal Pathology Coding Forms, page 14.

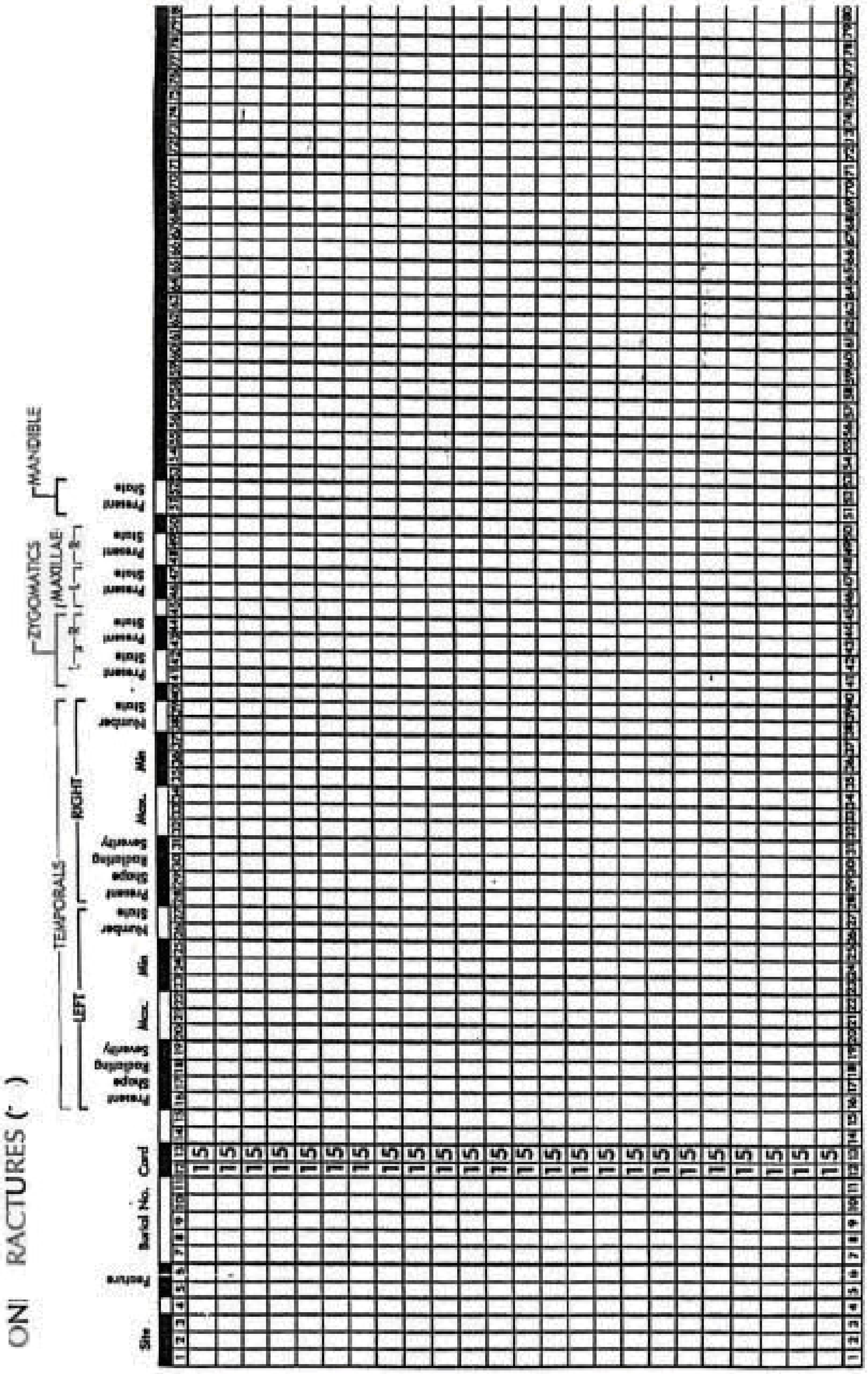


Figure A.22: Skeletal Pathology Coding Forms, page 15.

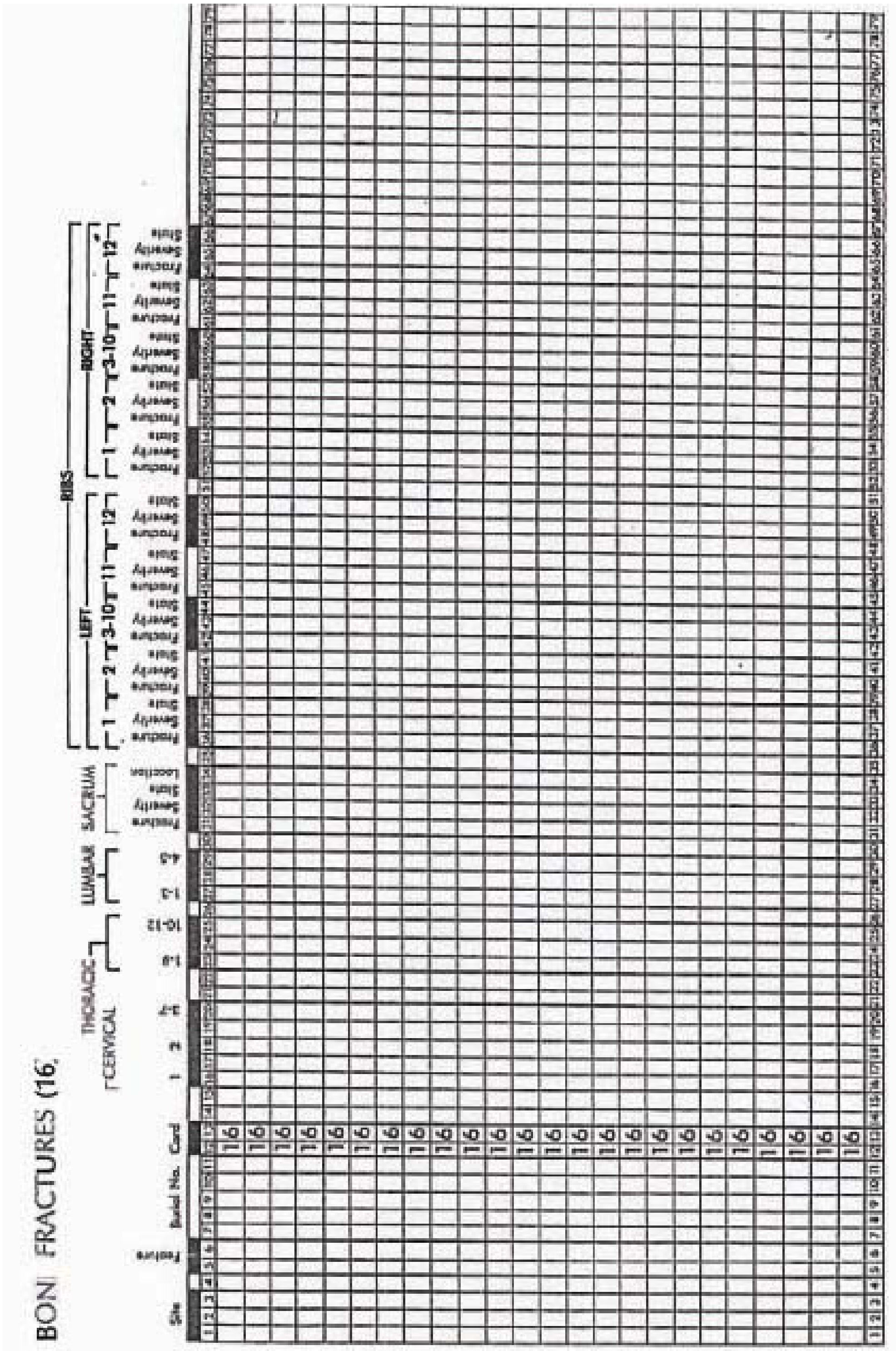
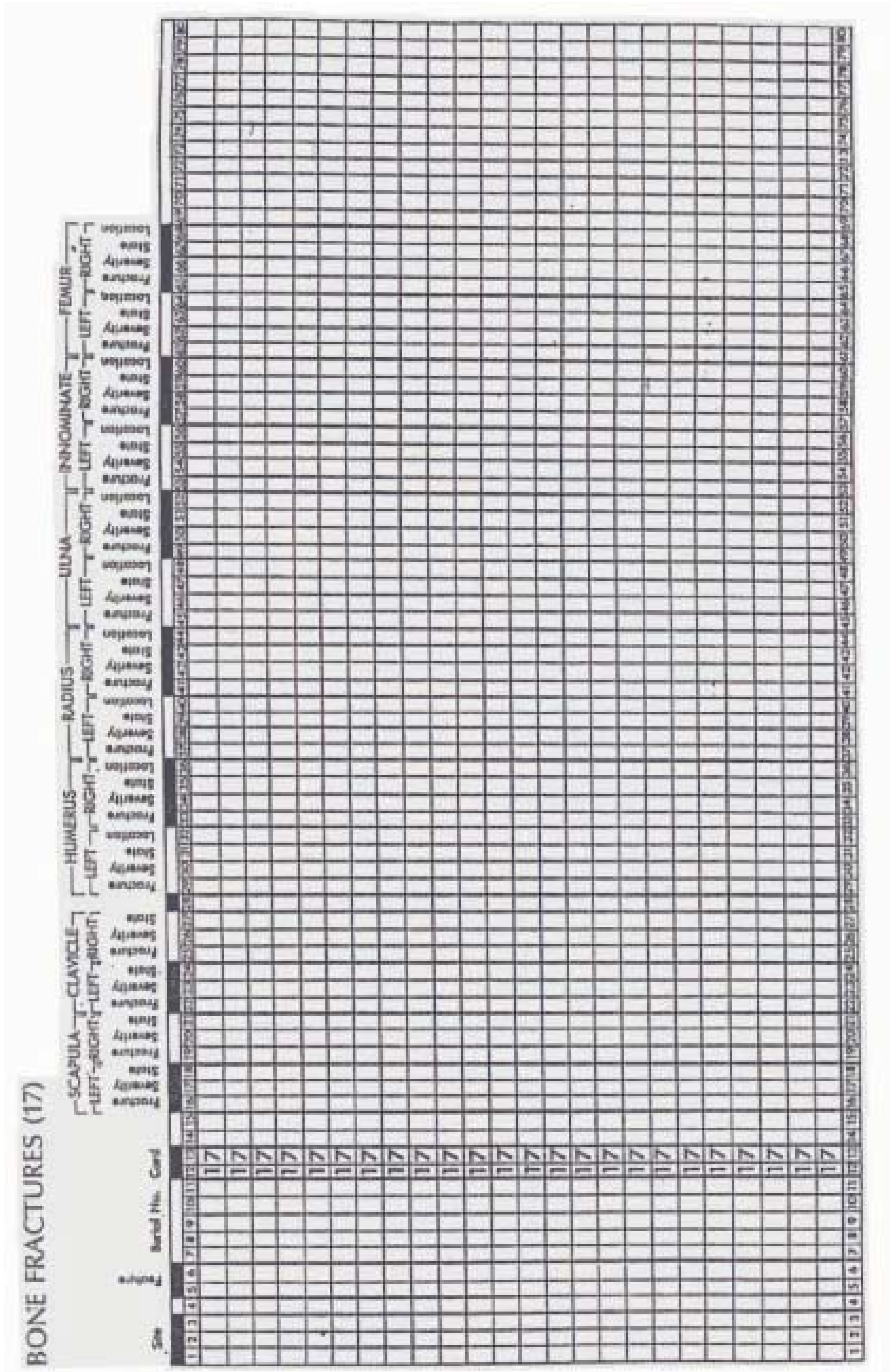


Figure A.23: Skeletal Pathology Coding Forms, page 16.



BONE FRACTURES (17)

Site | Feature | Burial No. | Card

SCAPULA: LEFT, RIGHT — Fracture, Severity, State
CLAVICLE: LEFT, RIGHT — Fracture, Severity, State
HUMERUS: LEFT, RIGHT — Fracture, Severity, State, Location
RADIUS: LEFT, RIGHT — Fracture, Severity, State, Location
ULNA: LEFT, RIGHT — Fracture, Severity, State, Location
INNOMINATE: LEFT, RIGHT — Fracture, Severity, State, Location
FEMUR: LEFT, RIGHT — Fracture, Severity, State, Location

Figure A.24: Skeletal Pathology Coding Forms, page 17.

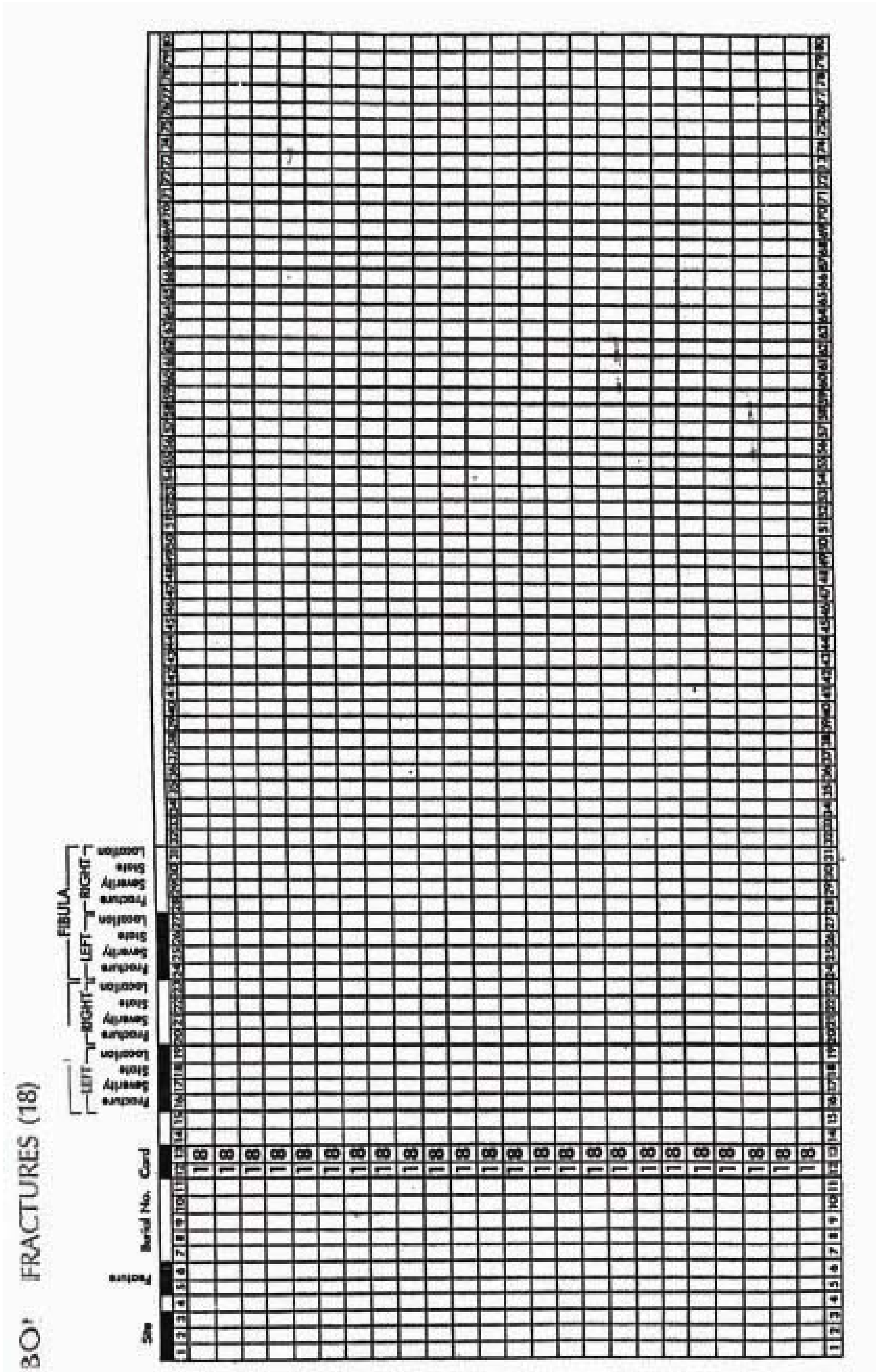


Figure A.25: Skeletal Pathology Coding Forms, page 18.

Western Hemisphere Data Coding Scheme

Site/Collection Identification
The given skeletal collection is identified by eight (8) alpha/numeric characters. These could be a site number (e.g., 23CG0234) or an abbreviated name (Cedargro).

Individual Identification
Each individual is identified with a unique series of five (5) alpha/numeric characters (e.g., 00345 or 0956B).

Inventory
Any statistical study of lesions must provide information about observable skeletal components. Thus, the coding scheme contains a category indicating that the appropriate skeletal components were available for observation. Any data available for a skeleton was recorded.

Demography

Sex:
The sex of the individual is designated with the single numeric code as follows:

1. Female, definite designation, the sex is certain
2. Probable Female, possible designation, but the investigator is uncertain
3. Male, definite designation, the sex is certain.
4. Probable Male, possible designation, but the investigator is uncertain
5. Sex is undetermined because the individual is less than 15 years of age and sex determination would be uncertain.
6. Unknown, the sex of the individual cannot be determined with any degree of reliability.

Age:

1) Summary age:

The investigator is asked to designate a single year (i.e., 37) as the age at death. This is the best estimate which the investigator can make. In its simplest form without additional information this age is nothing more than the midpoint of the designated age range. Age is given in years using decimals to designate tenths of years (conversion of months). Individuals aged greater than 60 years, and for whom no further estimate is possible, are coded as 99. Summary age is recorded as a four (4) digit numeric field with one decimal place (e.g., 00.6 or 35.5).

2) Dental age:

A dental age for children is required for the growth analysis. In many cases the dental age and the summary age are the same, however this category uses only dental development, whereas the summary age may include other sources of information. Dental age is recorded as a four (4) digit numeric field with one decimal place (e.g., 03.4).

3) Age range:

It is preferable to use standardized age ranges (i.e., 50-54 years), but the data to be coded have already been collected and age ranges differ between investigators. We cannot expect after the fact concordance. The investigator provided the age range in years for that individual. For categories such as subadult or old adult, the investigator defined this category by providing an age range in years. If such ranges are being determined for this project, then standard five year intervals (i.e., 30-34 years) are employed. Age range is recorded as two numeric fields with two characters in each. The first represents the minimum age (e.g., 30) and the second the maximum age (e.g., 45).

4) Date of Birth:

Where known the date of birth or decade (by using the midpoint, i.e., 1915) is recorded. Date of birth is a single field with four (4) numeric characters.

Continental Ancestry

Each skeleton is assigned to one of these populations of origin:

1. Native American
2. European
3. African
4. Asian
5. Mixed, any mixture of the above. This code is based the site context or from the historic literature. Although there are various degrees of mixture in some the groups, we cannot reliably estimate the mixture for an individual skeleton.
6. Unknown. Continental ancestry is a single character numeric field.

Social Status

Social Stratification Codes:

1) Denotes undifferentiated societies, reflecting the lack of significant differences in social stratification observable in the grave goods, and in archeological or historical evidence. If there is any doubt whether the presence of grave goods has any status meaning, these individuals or groups are placed here.

2) A ranked society is one in which there are social differences with groups or individuals having clear differential access to luxury or exotic goods. Membership in this category may be determined from either grave goods or historical records including archeological interpretation.

3) A class stratified society is one in which there are social differences with groups or individuals having clear differential access to wealth and/or subsistence resources. Assignment to this category may be determined from either grave goods or historical records including archeological interpretation.

Number of Social Stratification Code:

The number of distinct social strata in the culture is designated by number. An undifferentiated society is coded as 1, a three strata society as 3, etc.

Individual Position Codes:

1) The person occupies the highest rank in a ranked society or is a member of an undifferentiated society.
2) The person occupies the second from the highest rank in a stratified society.
3) The person occupies the third from the highest rank in a stratified society.
4) The person occupies the fourth from the highest rank in a stratified society; etc.

Social Stratification Coding.

The coding of social stratification uses a three (3) digit numeric code with the first designating the presence or kind of stratification in the society, the second the number of social strata, and the third the position of the individual in the social ranking. For example, a person in an undifferentiated society is coded as 111. A person in an historic class society could be coded as 331 (a class society, three classes, person belongs to highest class). If all that can be determined is that the society is ranked with only tendencies for high or low social status then the code might be 222 for a ranked society, two levels, and person belonging to the low social status.

Growth and Heights

Growth:

Maximum diaphyseal lengths of the femora (left is first then right if left is unavailable) are used to calculate growth statuses of juveniles using ages determined from dental development. Only the diaphyseal length (no epiphyses) are recorded here. This field contains three numeric characters for the measurement in millimeters.

Femur Length:

The maximum length of the left femur (right if left is unavailable) recorded in millimeters.The femur length field contains three numeric characters and the lengths are recorded in millimeters.

Adult Heights:

Heights are reported from historical documents on living populations (if available), and are estimated based on femoral length (adults) in skeletal samples. The left femur (maximum length) is preferred, then the right femur, but any long bone can be used for calculating heights. Heights, either calculated from long bones or derived from records are recorded in a 4 character numeric field in millimeters.

Enamel hypoplasias

The hypoplasias recorded are only linear groves that can be clearly seen with the unaided eye under good illumination. Only systemic hypoplasias are recorded and the left teeth are used, but rights are reported if lefts are not available. There is one column for each of the 1) deciduous maxillary central incisor, 2) deciduous canine (maxillary or mandibular), 3) permanent maxillary central incisor, 4) permanent canine (either maxillary or mandibular) teeth

Scoring:

0) Not observable (no suitable teeth, incomplete development, or too worn, etc.).
1) No hypoplasia.
2) One hypoplasia.
3) Two or more hypoplasias.

Anemia

Cribra Orbitalia is scored as:

0) no orbits to be observed.
1) absent on at least one observable orbit.
2) presence of a lesion.
3) gross lesions with excessive expansion and large area of exposed diploe, which is the form associated with sickle cell disease and other severe forms of anemia.

Porotic Hyperostosis is scored as:

0) no parietals to be observed.
1) absent on at least one observable parietal.
2) presence of a lesion.
3) gross lesions with excessive cranial expansion and huge areas of exposed diploe, which is the form associated with sickle cell disease and other severe forms of anemia.

Infection/Periosteal Reactions

There are two sets of scores, with the first being for the tibiae and the second for the remainder of the skeleton. Each of the fields contain one (1) numeric character. Active and healed lesions are not differentiated

Tibial scores:

0) no tibia(e) present for scoring.
1) no infectious lesions of the tibia(e) with at least one tibia available for observation.
2) slight, small discrete patch(s) of periosteal reaction involving less than one quarter of the tibia(e) surface on one or both tibiae.
3) moderate periosteal reaction involving less than onehalf of the tibia(e) surface on one or both tibiae.
4) severe periosteal reaction involving more than one-half of the tibia(e) surface (osteomyelitis is scored here).

Remaining skeleton:

0) no periosteal reaction on any other bone than the tibiae.
1) periosteal reaction on any other bone(s) than the tibiae not caused by trauma.
2) evidence of systemic infection involving any of the bones (including the tibiae) of the skeleton. This would include specific diseases which include (but are not limited to) tuberculosis and syphilis.

Degenerative Joint Disease

There are eight (8) fields, each with one numeric character. The most severe manifestation from either the right or left side is scored.

Shoulder and Elbow are scored as one unit and if either joint is affected (score the most severely affected joint).

0) joints not available for observation.
1) joints show no sign of degenerative disease.
2) initial osteophyte or deterioration of the joint surfaces.
3) major osteophyte formation and/or destruction of the joint surface such as eburnation.
4) immobilization of the joint due only to degenerative disease.
5) systemic degenerative disease (e.g., rheumatoid arthritis, Alkaptonuria, etc.).

Hip and Knee are scored as one unit and if either joint is affected (score the most severely affected joint).

0) joints not available for observation.
1) joints show no sign of degenerative disease.
2) initial osteophyte or deterioration of the joint surfaces.

3) major osteophyte formation and/or destruction of the joint surface such as eburnation.
4) immobilization of the joint.
5) systemic degenerative disease.

Vertebrae are scored by type: cervical, thoracic, and lumbar. If four or more thoracic vertebrae are present, they are scored and if two or more cervical or lumbar are present, they are scored. Only the bodies of the vertebrae are scored for the most severe expression:

Cervical:
0) not observable.
1) no lesions on at least two observable vertebrae.
2) initial osteophyte formation along rim of the vertebral body(ies).
3) extensive osteophyte formation along rim of the vertebrae.
4) two or more vertebrae fused together.

Thoracic:
0) not observable.
1) no lesions on at least four observable vertebrae.
2) initial osteophyte formation along rim of the vertebral body(ies).
3) extensive osteophyte formation along rim of the vertebrae.
4) two or more vertebrae fused together (keeping in mind that kyphosis from tuberculosis would be scored under infectious disease and not here).

Lumbar:
0) not observable.
1) no lesions on at least two observable vertebrae.
2) initial osteophyte formation along rim of the vertebral body(ies).
3) extensive osteophyte formation along rim of the vertebrae.
4) two or more vertebrae fused together.

Temporomandibular Joint:
0) TMJ not observable.
1) no deterioration.
2) joint deterioration.

Wrist and Hands, Radio-ulnar joint:
0) bones not observable or not recorded.
1) no degenerative disease of the joint.
2) degenerative disease of the joint

Bones of the hand:
0) bones not observable or not recorded.
1) no degenerative disease of the joint.
2) degenerative disease of the joint.

Trauma

Unless it can be shown to be premortem or perimortem traumata (e.g., saw marks of an amputation or axe wound), they are only scored when there is some evidence of healing. Any form of surgery would be recorded as trauma. It is critical that postmortem modifications or damage not be recorded.

There are seven fields, each with one numeric character:

Arm: humerus, radius and ulna. If any bone shows trauma, it is scored as follows:
0) no long bones observable (must have humerus and at least one bone of the forearm to be scored).
1) not fractured.
2) healed fracture with acceptable alignment.
3) healed and poorly aligned.
4) healed with fusion of the joint.
5) healed fracture with alignment unknown.

Leg: femur, tibia, and fibula. If any bone shows trauma it is scored as follows:
0) no long bones observable (must have femur and tibia or fibula).
1) no fracture or other trauma.
2) healed fracture with acceptable alignment.
3) healed and poorly aligned with some loss of locomotor function.
4) healed with extreme loss of locomotor function such as loss of limb or complete fusion of the joint in the lower limb.
5) healed with alignment unknown.

Nasal and Nasal Process:
0) no bones to be observed
1) no fracture.
2) healed fracture.

Face Other than Nasal:
0) no bones to be observed.
1) no fracture.
2) healed fracture.

Skull Vault:

0) no bones to be observed.
1) no fracture.
2) healed fracture.

Hand Fractures:

0) no bones to be observed or not recorded.
1) no fracture.
2) healed fracture(s).

Weapon Wounds to any Part of the Body and Head:

1) no weapon wounds.
2) weapon wound(s).

Appendix C

Results

Providence Baptist Church Cemetery Analysis Results

Osteoarthritis

Table A.1: Frequency of mild osteoarthritis in adult males and females from the Providence Baptist Church Cemetery part 1.

	Humerus Proximal				Radius Proximal				Ulna Proximal				Femur Proximal				Tibia Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	1	0.1428	0		0		0		0		1	0.1428	1	0.125	0		0		1	0.1429
Male 35+	4	0.3333	3	0.25	1	0.1	2	0.2222	5	0.42	5	0.4166	6	0.5	4	0.3636	2	0.2222	2	0.2
Female 15-34	0		0		0		0		0		0		0		0		0		0	
Female 35+	5	0.4545	7	0.636	1	0.25	2	0.2222	5	0.38	7	0.5384	4	0.3333	5	0.4167	6	0.5	7	0.6364
	Humerus Distal				Radius Distal				Ulna Distal				Femur Distal				Tibia Distal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	0		1	0.2	0		0		0		0		1	0.125	1	0.125	1	0.125	0	
Male 35+	4	0.3076	4	0.308	3	0.3	1	0.1429	2	0.29	3	0.5	4	0.3077	4	0.3077	5	0.3846	4	0.3636
Female 15-34	0		0		0		0		0		0		0		0		0		0	
Female 35+	3	0.2727	4	0.364	3	0.333333	4	0.5	3	0.43	2	0.2857	3	0.2143	4	0.3077	3	0.25	4	0.3636

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.2: Frequency of mild osteoarthritis in adult males and females from the Providence Baptist Church Cemetery part 2.

	TMJ				Mandible		Scapula				Acetabulum			
Sex/Age	L	%	R	%	N	%	L	%	R	%	L	%	R	%
Male 15-34	0		0		0	0	1	0.125	1	0.125	1	0.125	1	0.125
Male 35+	1	0.0714	2	0.1429	1	0.0769	5	0.3571	2	0.1429	9	0.6923	9	0.6923
Female 15-34	0		0		0	0	0		0		0		0	
Female 35+	0		0		1	0.0769	4	1	4	0.3077	8	0.6667	8	0.7273

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.3: Frequency of mild osteoarthritis in adult males and females from the Providence Baptist Church Cemetery part 3.

	Sacroiliac				Patella				Calcaneus			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	1	0.125	0		0		0		0		0	
Male 35+	5	0.3846	6	0.4615	3	0.3	5	0.4167	2	0.2	3	0.30
Female 15-34	0		0		0		0		0		0	
Female 35+	3	0.25	1	0.0909	3	0.3333	3	0.3333	5	0.5	6	0.6

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.4: Frequency of moderate osteoarthritis in adult males and females from the Providence Baptist Church Cemetery part 1.

	Scapula				Acetabulum				Sacroiliac				Patella			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	1	0.0714	3	0.214	0	-	1	0.0769	0	-	0	-	1	0.1	0	-
Female 35+	1	0.0714	1	0.077	1	0.0833	1	0.0909	0	-	1	0.0909	1	0.111	0	-

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.5: Frequency of moderate osteoarthritis in adult males and females from the Providence Baptist Church Cemetery part 2.

	Humerus Proximal				Radius Proximal				Ulna Proximal				Femur Proximal				Tibia Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	1	0.0833	0		1	0.1	2	0.2222	2	0.17	1	0.0833	2	0.167	2	0.1818	1	0.111	1	0.1
Female 35+	1	0.0909	0		0		0		0		0		1	0.083	0		1	0.083	0	
	Humerus Distal				Radius Distal				Ulna Distal				Femur Distal							
Male 15-34	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%				
Female 15-34	1	0.0769	1	0.077	0		1	0.1429	1	0.14	0		1	0.077	1	0.0769				
	0		0		0		0		0		0		2	0.143	1	0.0769				

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.6: Frequency of severe osteoarthritis in adult males and females from the Providence Baptist Church Cemetery.

	Humerus Proximal				Radius Proxima				Ulna Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	0		0		0		0		0		0	
Male 35+	0		2	0.167	1	0.1	0		0		2	0.1667
Female 15-34	0		0		0		0		0		0	
Female 35+	0		0		0		0		0		0	

	Humerus Distal			
Sex/Age	L	%	R	%
Male 15-34	0		0	
Male 35+	0		1	0.077
Female 15-34	0		0	
Female 35+	0		0	

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Porosity

Table A.7: Frequency of mild porosity in adult males and females from the Providence Baptist Church Cemetery part 1.

	TMJ				Mandible		Scapula				Acetabulum				Calcaneus			
Sex/Age	L	%	R	%	N	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	1	0.2	0	-	0	-	0	-	1	0.125	1	0.125	0	-	0	-	0	-
Male 35+	2	0.1429	5	0.3571	2	0.1539	3	0.2143	5	0.357	6	0.4615	5	0.3846	0	-	0	-
Female 35+	5	0.3846	3	0.2308	4	0.3077	2	0.1429	2	0.154	3	0.25	6	0.5455	0	-	2	0.2

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.8: Frequency of mild porosity in adult males and females from the Providence Baptist Church Cemetery part 2.

	Humerus Proximal				Radius Proximal				Ulna Proximal				Femur Proximal				Tibia Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	0	-	0	-	0	-	0	-	0	-	1	0.143	1	0.125	0	-	0	-	0	-
Male 35+	1	0.083	1	0.083	2	0.2	3	0.333	2	0.167	3	0.25	1	0.083	4	0.364	2	0.222	1	0.1
Female 35+	0		0		1	0.0833	1	0.083	2	0.154	2	0.154	1	0.083	3	0.25	3	0.25	2	0.1818
	Humerus Distal				Radius Distal				Ulna Distal				Femur Distal				Tibia Distal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	2	0.154	4	0.307	0	-	2	0.286	1	0.143	2	0.167	2	0.154	2	0.154	0	0	1	0.091
Female 35+	2	0.182	2	0.182	2	0.2222	0	-	0	-	2	0.286	3	0.214	2	0.154	0	-	0	-

L=Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.9: Frequency of moderate porosity in adult males and females from the Providence Baptist Church Cemetery.

	Acetabulum				Patella				Radius Proximal				Ulna Distal				Femur Proximal				Femur Distal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	1	0.077	1	0.077	0		0	-	1	0.1	0		2	0.286	0		1	0.083	1	0.091	0		1	0.077
Female 15-34	0		1	0.2	0		0	-	-	-	-	-	-	-	-	-	-	-	-	-	0		0	
Female 35+	2	0.167	2	0.182	1	0.111	0	-	-	-	-	-	-	-	-	-	-	-	-	-	0		1	0.077

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.10: Frequency of severe porosity in adult males and females from the Providence Baptist Church Cemetery.

	Scapula				Patella				Humerus Proximal				Radius Proximal				Ulna Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%	L	%	R	%
Male 15-34	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-	0	-
Male 35+	0	-	1	0.071	0	-	0	-	0	-	1	0.083	0	-	1	0.1111	0	-	3	0.25
Female 35+	0	-	0	-	0	-	1	0.11	0	-	0	-	-	-	-	-	-	-	-	-

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Eburnation

Table A.11: Frequency of mild eburnation in adult males and females from the Providence Baptist Church Cemetery part 1.

	Scapula				Acetabulum				Patella			
Sex/Age	L	%	R	%	L	%	R		L	%	R	%
Male 15-34	1	0.125	-	-	0	-	0	-	0	-	0	-
Male 35+	0	-	-	-	1	0.077	1	0.077	0	-	0	-
Female 35+	0	-	-	-	0	-	0	-	0	-	1	0.111

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.12: Frequency of mild eburnation in adult males and females from the Providence Baptist Church Cemetery part 2.

	Humerus Proximal				Radius Proximal				Femur Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	-	-	0	-	1	0.1	0	-	1	0.083	1	0.091
	Humerus Distal				Ulna Distal Mild				Femur Distal Mild			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+	1	0.077	1	0.077	1	0.143	1	0.167	0	-	0	-
Female 35+	0	-	0	-	0	-	0	-	1	0.071	1	0.077

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Table A.13: Frequency of moderate eburnation in adult males and females from the Providence Baptist Church Cemetery.

	Humerus Proximal				Humerus Distal				Radius Proximal			
Sex/Age	L	%	R	%	L	%	R	%	L	%	R	%
Male 35+			1	0.083	0		1	0.077	0		2	0.2

L = Number of left skeletal elements affected.
R= Number of right skeletal elements affected.

Degenerative Joint Disease of the Spinal Column

Table A.14: Frequency of mild osteoarthritis of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Cervical facets		Thoracic facets		Lumbar facets	
Sex/Age	N	%	N	%	N	%
Male 15-34	2	0.25	3	0.375	2	0.25
Male 35+	6	0.67	6	0.461	4	0.308
Female 15-34	0	-	1	0.2	0	-
Female 35+	7	0.5	5	0.384	8	0.571

N= number of vertebrae affected.

Table A.15: Frequency of moderate osteoarthritis of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Cervical facets		Thoracic facets		Lumbar facets	
Sex/Age	N	%	N	%	N	%
Male 35+	1	0.083	2	0.154	2	0.154
Female 35+	0	-	1	0.077	4	0.286

N= number of vertebrae affected.

Table A.16: Frequency of mild osteoarthritis of the vertebral centra in adult males and females from the Providence Baptist Church Cemetery.

	Cervical centrum		Thoracic centrum		Lumbar centrum	
Sex/Age	N	%	N	%	N	%
Male 15-34	0	-	1	0.125	1	0.125
Male 35+	2	0.167	5	0.385	3	0.231
Female 15-34	0	-	1	0.2	0	-
Female 35+	0	-	5	0.385	4	0.285

N=number of vertebrae affected.

Table A.17: Frequency of moderate osteoarthritis of the vertebral centra in adult males and females from the Providence Baptist Church Cemetery.

	Thoracic centrum		Lumbar centrum	
Sex/Age	N	%	N	%
Male 35+	1	0.077	1	0.077
Female 35+	2	0.154	2	0.154

N=number of vertebrae affected.

Table A.18: Frequency of mild porosity of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Cervical facets		thoracic facets		Lumbar facets	
Sex/Age	N	%	N	%	N	%
Male 15-34	0		1	0.1428	1	0.125
Male 35+	4	0.3333	8	0.6153	5	0.3846
Female 15-34	0	-	1	0.2	0	-
Female 35+	5	0.3571	7	0.5384	5	0.3571

N=number of vertebrae affected.

Table A.19: Frequency of moderate porosity of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Lumbar facets	
Sex/Age	N	%
Male 35+	3	0.231
Female 35+	4	0.286

N=number of vertebrae affected.

Table A.20: Frequency of mild eburnation of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Cervical facets		Thoracic facets		Lumbar facets	
Sex/Age	N	%	N	%	N	%
Male 35+	1	0.083	0	-	3	0.231
Female 35+	3	0.214	2	0.154	4	0.286

N=number of vertebrae affected.

Table A.21: Frequency of moderate eburnation of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Thoracic facets		Lumbar facets	
Sex/Age	N	%	N	%
Male 35+	0	-	1	0.076
Female 35+	1	0.076	1	0.071

N=number of vertebrae affected.

Table A.22: Frequency of severe eburnation of the vertebral facets in adult males and females from the Providence Baptist Church Cemetery.

	Lumbar facets	
Sex/Age	N	%
Female 35+	1	0.071

N=number of vertebrae affected.

Comparison of Providence Baptist Cemetery to Freedman's Cemetery and Cedar Grove Cemetery.

Males

Metabolic:

Table A.23: Contingency table for LEH on incisors for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By hyp – LPI

Count	1	2	3	Total
3La	1	3	7	11
40Sy619	11	2	2	15
41D	172	53	17	241
Total	184	58	26	268

Table A.24: Contingency table for LEH on canines for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By hyp –LPC.

Count	1	2	3	Total
3La	0	1	11	12
40Sy619	10	5	3	17
41D	87	87	80	253
Total	97	93	93	282

Table A.25: Contingency table for Cribra Orbitalia for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By CROB.

Count	1	2	Total
3La	11	1	14
40Sy619	19	2	21
41D	101	10	111
Total	131	15	146

Table A.26: Contingency table for porotic hyperostosis for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By PORHY.

Count	1	2	Total
3La	9	5	14
40Sy619	21	0	21
41D	211	9	219
Total	241	14	254

Infection:

Table A.27: Contingency table for tibial infection for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TIBINF.

Count	1	2	3	4	Total
3La	5	2	2	6	15
40Sy619	17	2	1	1	21
41D	115	87	30	9	240
Total	137	91	33	16	276

Table A.28: Contingency table for skeletal infection for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By SKELINF.

Count	1	2	Total
3La	10	3	13
40Sy619	9	0	9
41D	34	93	127
Total	53	96	149

Osteoarthritis:

Table A.29: Contingency table for DJD of the shoulder and elbow for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJSH.

Count	1	2	3	5	Total
3La	13	1	0	0	14
40Sy619	11	7	2	1	21
41D	66	75	13	0	153
Total	90	83	15	1	188

Table A.30: Contingency table for DJD of the hip and knee for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJHK.

Count	1	2	3	4	5	Total
3La	11	2	1	1	0	15
40Sy619	8	10	1	0	1	20
41D	71	67	15	0	0	152
Total	90	79	17	1	1	187

Table A.31: Contingency table for DJD of the cervical vertebrae for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJCER.

Count	1	2	3	4	Total
3La	10	2	2	1	15
40Sy619	11	7	2	0	20
41D	47	26	18	2	92
Total	68	35	22	3	127

Table A.32: Contingency table for DJD of the thoracic vertebrae for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJTHO.

Count	1	2	3	4	Total
3La	9	5	1	0	15
40Sy619	13	5	1	1	20
41D	40	18	8	0	66
Total	62	28	10	1	101

Table A.33: Contingency table for DJD of the lumbar vertebrae for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJLUM.

Count	1	2	3	Total
3La	8	5	2	15
40Sy619	11	6	3	20
41D	36	18	21	75
Total	55	29	26	110

Table A.34: Contingency table for DJD in the temporomandibular joint for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJTMJ.

Count	1	2	Total
3La	14	0	14
40Sy619	13	8	21
41D	56	51	106
Total	83	59	141

Table A.35: Contingency table for DJD of the wrist for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site by DJWR.

Count	1	2	Total
3La	13	2	15
40Sy619	15	5	20
41D	89	33	122
Total	117	40	157

Table A.36: Contingency table for DJD of the hand for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJHAN.

Count	1	2	Total
3La	13	2	15
40Sy619	13	6	19
41D	73	56	128
Total	99	64	162

Trauma:

Table A.37: Contingency table for trauma of the arm for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRARM.

Count	1	2	3	Total
3La	14	1	0	15
40Sy619	20	0	1	21
41D	211	5	2	217
Total	245	6	3	253

Table A.38: Contingency table for trauma of the leg for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRLEG.

Count	1	2	3	4	Total
3La	10	2	1	2	15
40Sy619	20	1	0	0	21
41D	225	11	3	1	239
Total	255	14	4	3	276

Table A.39: Contingency table for trauma of the skull for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRSKUL.

Count	1	2	Total
3La	12	3	15
40Sy619	20	1	21
41D	219	13	231
Total	251	17	267

Table A.40: Contingency table for trauma of the hand for males in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRHAN.

Count	1	2	Total
3La	12	3	15
40Sy619	15	3	21
41D	105	10	115
Total	132	16	148

Females Pathology

Metabolic:

Table A.41: Contingency table for LEH on incisors for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By hyp – LPI.

Count	1	2	3	Total
3La	4	2	8	14
40Sy619	12	1	0	13
41D	182	35	11	228
Total	198	38	19	255

Table A.42: Contingency table for LEH on canines for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By hyp –LPC.

Count	1	2	3	Total
3La	4	1	12	17
40Sy619	9	2	3	14
41D	120	78	46	244
Total	133	81	61	275

Table A.43: Contingency table for cribra orbitalia for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By CROB.

Count	1	2	Total
3La	20	1	21
40Sy619	16	1	17
41D	85	9	94
Total	121	11	132

Table A.44: Contingency table for porotic hyperostosis for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By PORHY.

Count	1	2	Total
3La	16	5	21
40Sy619	17	0	17
41D	198	21	219
Total	231	26	257

Infection:

Table A.45: Contingency table for tibial infection for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TIBINF.

Count	1	2	3	4	Total
3La	11	5	3	1	20
40Sy619	16	2	0	1	19
41D	106	78	25	5	214
Total	133	85	28	6	253

Table A.46: Contingency table for skeleton infection for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By SKELINF.

Count	1	2	Total
3La	11	0	11
40Sy619	5	1	6
41D	23	93	116
Total	39	94	133

Osteoarthritis:

Table A.47: Contingency table for DJD of the shoulder and elbow for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJSH.

Count	1	2	3	Total
3La	14	5	1	20
40Sy619	12	6	0	18
41D	101	42	2	183
Total	127	53	3	183

Table A.48: Contingency table for DJD of the hip and knee for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJHK.

Count	1	2	3	4	Total
3La	15	2	1	1	19
40Sy619	10	7	1	0	18
41D	92	36	10	0	138
Total	117	45	12	1	175

Table A.49: Contingency table for DJD of the cervical vertebrae for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJCER.

Count	1	2	3	Total
3La	15	3	2	20
40Sy619	11	6	2	19
41D	67	20	9	96
Total	93	29	13	135

Table A.50: Contingency table for DJD of the thoracic vertebrae for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJTHO.

Count	1	2	3	4	Total
3La	15	3	1	1	20
40Sy619	9	10	0	0	19
41D	47	16	1	0	64
Total	71	29	2	1	103

Table A.51: Contingency table for DJD of the lumbar vertebrae for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJLUM.

Count	1	2	3	Total
3La	14	4	2	20
40Sy619	8	8	2	18
41D	42	23	6	71
Total	64	35	10	109

Table A.52: Contingency table for DJD of the temporomandibular joint for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJTMJ.

Count	1	2	Total
3La	20	0	20
40Sy619	13	4	17
41D	69	35	104
Total	102	39	141

Table A.53: Contingency table for DJD of the wrist for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJWR.

Count	1	2	Total
3La	18	2	20
40Sy619	16	2	18
41D	93	19	112
Total	127	23	150

Table A.54: Contingency table for DJD of the hand for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By DJHAN.

Count	1	2	Total
3La	15	5	20
40Sy619	11	5	16
41D	85	26	111
Total	111	36	147

Trauma:

Table A.55: Contingency table for trauma of the arm for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRARM.

Count	1	2	3	Total
3La	17	1	2	20
40Sy619	17	2	0	19
41D	191	1	1	193
Total	225	4	3	232

Table A.56: Contingency table for trauma of the leg for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRLEG.

Count	1	2	Total
3La	20	0	20
40Sy619	19	0	19
41D	209	5	214
Total	248	5	252

Table A.57: Contingency table for trauma of the skull for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRSKUL.

Count	1	2	Total
3La	21	0	21
40Sy619	17	0	17
41D	223	7	230
Total	261	7	268

Table A.58: Contingency table for trauma of the hand for females in the Providence Baptist, Cedar Grove, and Freedman's cemetery populations. Site By TRHAN.

Count	1	2	Total
3La	20	0	20
40Sy619	15	1	16
41D	98	0	98
Total	133	1	134

Vita

Rebecca J. Wilson was born September 19, 1979, as the eighth child of Thomas and Joyce Wilson. She was raised in Atco, New Jersey where she attended elementary school and graduated from Edgewood Regional Senior High school in 1997. She went on to Juniata College in Huntingdon, Pennsylvania where she earned a Bachelor's of Science degree in Biology with a concentration in Anthropology in 2001. She continued on to the University of Tennessee, Knoxville completing a Masters of Arts degree in 2005.

Rebecca is currently pursuing a doctorate in physical anthropology at the University of Tennessee, Knoxville, Tennessee.