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A Study of a Turn of the 20th Century Skeletal Collection from Memphis, TN

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By

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This thesis is a comparative and descriptive study of a turn of the 20th century human commingled skeletal collection from Memphis, TN. The Memphis Regional Forensic Center (MRFC) collection is over four hundred elements recovered in various states of fragmentation. This study focused primarily on the occurrence and prevalence of anatomical cutting and osteoarthritis of the MRFC collection in comparison to contemporary osteological samples to provide insight into a subset of people living in late 19th/early 20th century Memphis, TN.

In the framework of biocultural theory, it was discovered that the MRFC collection likely represented individuals subjected to "structural violence" through medical dissection. An analysis of the Shelby County mortality records also appears to support this possibility. Finally, based on osteoarthritis prevalence, it was inconclusive whether or not the collection represented a more urban or rural population.

DEDICATION

I would like to dedicate this thesis to the American tax payer. You have indirectly funded this thesis by keeping me employed for the past few years. Thank you.

ACKNOWLEDGEMENTS

I would like to acknowledge Evan Peacock, Nicholas Herrmann, Janet Rafferty, and Molly Zuckerman for their work on my thesis committee. I cannot thank you enough for your patience. I would also like to thank Joseph Smith and Abby Wong for helping to keep me sane during the final stages of writing this thesis. Finally, I would like to thank my family for the support they always provide.

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CHAPTER I

INTRODUCTION AND BACKGROUND

The Memphis Regional Forensic Center (MRFC) osteological collection was discovered during building construction at 255 North Main St., Memphis, Tennessee in April of 2000. According to *The Commercial Appeal*, a prominent Memphis newspaper, one afternoon a construction worker unearthed more than just dirt. While digging through a brick-lined cistern, this surprised construction worker found various human skeletal remains. After this morbid discovery, the local police were notified and the Shelby County Medical Examiner, Dr. O.C. Smith, was called to the site. After assisting in the excavation, Smith was quoted as saying, "There are fresh saw marks with no healing on some of the bones, so those happened at the time of death or after, and there were surgically placed burr holes in at least one of the skulls" (Buser, 2000).

Additionally, Nick Fielder, the state archaeologist, was called to the site to determine if the remains had any archaeological significance. After reaffirming Smith's assessment, the archaeologist allowed construction to continue the day after the remains were recovered. The holes in which the artifacts were excavated were then back-filled with concrete. Again, according to *The Commercial Appeal,* the remains predated the construction of the old Ellis Auditorium, which opened in 1924 (Bailey, 2000).

Even with local news outlets having reported on the site discovery, not much is known about the MRFC excavation. According to the Tennessee State Historic

Preservation Office, no archaeological sites are recorded for this immediate area and no cemetery records are on file (Hoyal and Nance, 2016). Apparently, either no detailed documentation (notes, mapping) was undertaken or the site field records were lost or otherwise never were incorporated in state site files. Either way, it is difficult to gauge the extent to which recovery methods may have biased the number, size, and types of bones that were recovered, except that a few photographs taken at the time (see Figures 1, 2, and 3) strongly imply that bones were hand collected without screening, which may have resulted in a bias toward recovery of larger, more robust elements. The collection was then stored at the Shelby County Medical Examiner's office before being moved to the University of Tennessee and subsequently moved to the Department of Anthropology and Middle Eastern Cultures at Mississippi State University.

In this thesis, I provide historical background on the assemblage, followed by basic description (sex, ancestry, mortality structure, osteoarthritis, and post-mortem modification) and contextualization of the findings via comparisons with contemporary assemblages from the published and technical literature.

Figure 1 MRFC Site Photograph

Direction Unknown, Photographer O.C. Smith or Steve Symes

Figure 2 MRFC Site Photograph

Direction Unknown, Photographer O.C. Smith or Steve Symes

Figure 3 MRFC Site Photograph

Direction Unknown, Photographer O.C. Smith or Steve Symes

Problem Statement

Even though there is a plethora of historical information regarding health and medical practices in the late 19th and early 20th centuries, there still are relatively few bioarchaeological studies focused on commingled human skeletal remains affected by dissection and/or anatomical cutting (e.g., Harrington and Blakely, 1995a). Given the known presence of saw marks and “surgically placed burr holes” (Buser 2000), an unusual treatment, on some of the bones, the MRFC skeletal sample could be representative of a cultural or socioeconomic group smaller than the contemporaneous Memphis population, such as a transient sub-population not normally seen in archaeological and/or historical records for Memphis. Working within the general framework of biocultural theory, I use a number of archaeological, historical, and osteological methods to study this small, commingled skeletal sample, to provide information on whether it represents a particular subset of the turn-of-the-twentieth-century Memphis population that was a target for post-mortem structural violence (Nystrom, 2014). Determining the representativeness of a sample in relation to its associated population is very important for demographic and paleodemographic studies (Jackes, 2011; Paine and Boldsen, 2002; Usher, 2002). To explore the nature of the MRFC collection, I compare age-at-death, sex and ancestry profile data from it to data from approximately contemporary (1901 and 1902) Shelby County death records. In addition, the Medical College of Georgia site, which contained elements that had been subjected to dissection and medical teaching practices (Harrington and Blakely, 1995a; see Chapter II), is used for a comparison of cut mark frequencies on particular elements in commingled assemblages.

Furthermore, this research intends to determine how the MRFC osteological collection fits in the "urban versus rural" health discussion (Davidson et al., 2002; Kelley and Angel, 1987; Wilson, 2005; Lewis, 1995; Lewis, 2002), which focuses on the expected health disparities between populations generally considered to be rural or urban based on various geographic, economic, or subsistence-based factors (e.g., Dockall et al., 1996; Grauer et al., 1999; Harl et al., 1996). Studies in this vein have been done of Antebellum enslaved African and Reconstruction-period African American burials (Rose et al., 1985; Shogren et al., 1989; Wilson, 2005) and cemeteries that represent diverse communities (African American individuals and those of European and Native American descent from both the New and Old World) (Harl et al., 1996; Lewis, 2002; Lewis et al., 1995; Murray, 1993; Wilson, 2005). Differences in location are hypothesized to be one of many factors that influence the overall health, morbidity (the rate of disease), and mortality (the rate of death over a period of time) of a population. Some of the variable health stressors typically examined between urban and rural populations include the degree of degenerative joint disease, trauma, diet, and varying types of infectious diseases (e.g., tuberculosis being more commonly found in urban populations, etc.) (Kelley and Angel, 1987). The focus here is a statistical comparison of pathology prevalence (specifically osteoarthritis) between samples (e.g., Wilson, 2005). A contemporaneous rural site, the Providence Baptist Cemetery (40SY619) (Wilson, 2005), and an urban site, the Hunter Army Airfield Cemetery (9CH875) (Matternes et al., 2010), are used for comparison.

Even though the MRFC osteological collection has the potential to contribute to the growing bioarchaeological literature on historic-period samples in North America, the collection is relatively small compared to other published assemblages. This limitation is taken into consideration when statistical comparisons were applied in this analysis.

Why Is This Data Set Important?

The MRFC commingled osteological remains are important to bioarchaeological research because they represent a scientific rarity for a specific historical time period. The presence of transverse cut marks and burr holes on some remains, likely indicative of anatomical processing, is not commonly found in traditional cemetery collections from the region or time period. Due to the placement (see Chapter VI) and probable saw-like method of such cutting, it is highly likely that various individuals represented in this collection were subjects of some form of postmortem modification: amputation, dissection, or general medical experimentation

Furthermore, unlike other arguably contemporary sites (e.g., Providence Baptist Church Cemetery [Wilson, 2005], Cedar Grove Cemetery [Rose et al., 1985], etc.), the MRFC osteological collection was not found while excavating a military or civilian cemetery. It was discovered in the context of a cistern in an historic tenement neighborhood of downtown Memphis (Sanborn Maps 1907). A similar case is that of the commingled osteological collection excavated at the Medical College of Georgia, which was also recovered outside of the normal cemetery context and which was determined to be a product of medical experimentation and education (Harrington and Blakely, 1995a;1995b). Both the MRFC and the Medical College of Georgia collections show signs of a system of "structural violence," or socially normalized harm done to them through dissection, reflecting social inequality, which warrants further study (Nystrom, 2014).

To further elaborate, "structural violence" is a term originally used by Galtung (1969) that describes economic, political, religious, and cultural social structures that keep individuals and groups from attaining their full potential (Farmer et al., 2006). According to Klaus (2012) and Nystrom (2014), to see structural violence in an archaeological setting one has to make the assumption that, "…socially derived disparities in access to and control over resources can have physiological consequences that can result in skeletal manifestations" (Nystrom, 2014:766). For example, a past legal system that used dissection as a means of judicial punishment (see discussion in Chapter II) could be interpreted archaeologically via human skeletal remains as a representation of "structural violence" against some particular group or sub-group. Due to the historic use of dissection in this manner (Dougherty and Sullivan, 2017; Grauer et al., 2017; Muller et al., 2017; Nystrom, 2014), it is possible that the individuals in the MRFC skeletal sample represent a specific subgroup (e.g., by age, sex, ancestry, or socioeconomic status) that was subjected to a systematic form of structural violence. This possibility can be explored by comparison of the demographic profile of the collection to contemporaneous burial records for individuals known to have been turned over to medical colleges after death in Memphis.

Historical and Archaeological Context

In 1819, Shelby County and the budding municipality of Memphis were formally established (Roper, 1970:69). Due to western expansion from Georgia, Virginia, and Kentucky, the city's population steadily grew. During the years 1840 through 1850, the population dramatically increased (Capers, 1939:106,125). However, this period of prosperous expansion did not last long.

During the Union's occupation of the city throughout the majority of the American Civil War, several epidemics negatively impacted the populace of Memphis (Capers, 1939:162,189). Additionally, from 1878 through 1879, a yellow fever outbreak caused an exodus of 25,000 citizens from the city (Capers, 1939:195). Following this evacuation and the death of approximately 5,000 people, Memphis lost its city charter in 1879 (Capers, 1939:203). It was not until 1893 that the city was re-established and regained its charter (Capers, 1939:203). Even with this tragic setback, Memphis experienced another population boom between 1890 and 1920 (Capers, 1939:203). With this expansion, Memphis became the 37th most populous metropolitan area in the United States by 1900 (U.S. Census Records, www.census.gov).

In 1924, the Ellis Auditorium was constructed on an entire city block on North Main Street (255 N. Main St.) covering the site where the MRFC skeletal collection would be recovered (see Figure 4). Sanborn maps dating from 1880 to 1949 show the Ellis Auditorium, then called the Memphis Auditorium, being pre-dated by the county court house building (constructed ca. 1860) (http://historic-memphis.com/memphis-historic/ellis/ellis.html; Sanborn Maps). With these historical data, we can see the construction patterns and numerous cisterns in the general area.

Furthermore, according to the Shelby County archives, there were twenty-three doctors who practiced near 255 N. Main between the years 1880 and 1920 (sampled years: 1880, 1890, 1900, 1920) (Shelby County Directory). Notably, in 1920, six doctors practiced immediately across the street at 256 N. Main. Considering that the MRFC collection shows signs of probable anatomical cutting, the site's proximity to contemporaneous doctors' offices may not be a coincidence.

However, considering that Strauch and Co. pawnbrokers (see Figure 5) are listed at 255 N. Main from 1920 to past 1924 (the date of construction of the Memphis Auditorium), rather than the county courthouse or the Ellis Auditorium building, there could be a problem with using this archival data. I believe that the archival address is either inaccurate compared to the modern-day address or that the archival records were not kept up to date through a span of years. Regardless, because we do know that the remains were excavated from under the known location of the Ellis Auditorium, we do know the city block where the MRFC remains were recovered, even if not the precise address. Considering that the proximity to doctor's offices may have played a role in the creation of the osteological assemblage, it is important to know at least the general contemporary location.

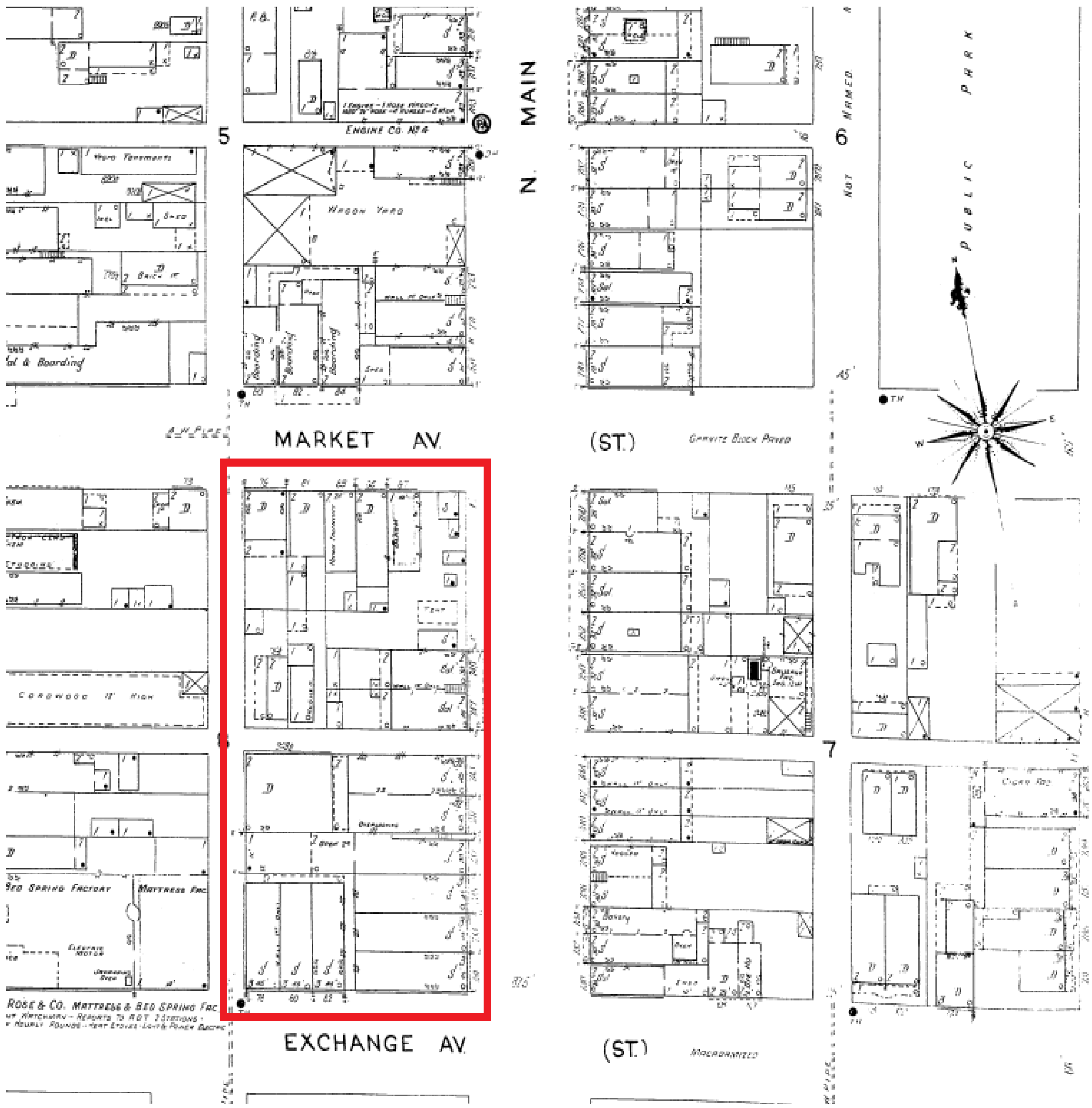
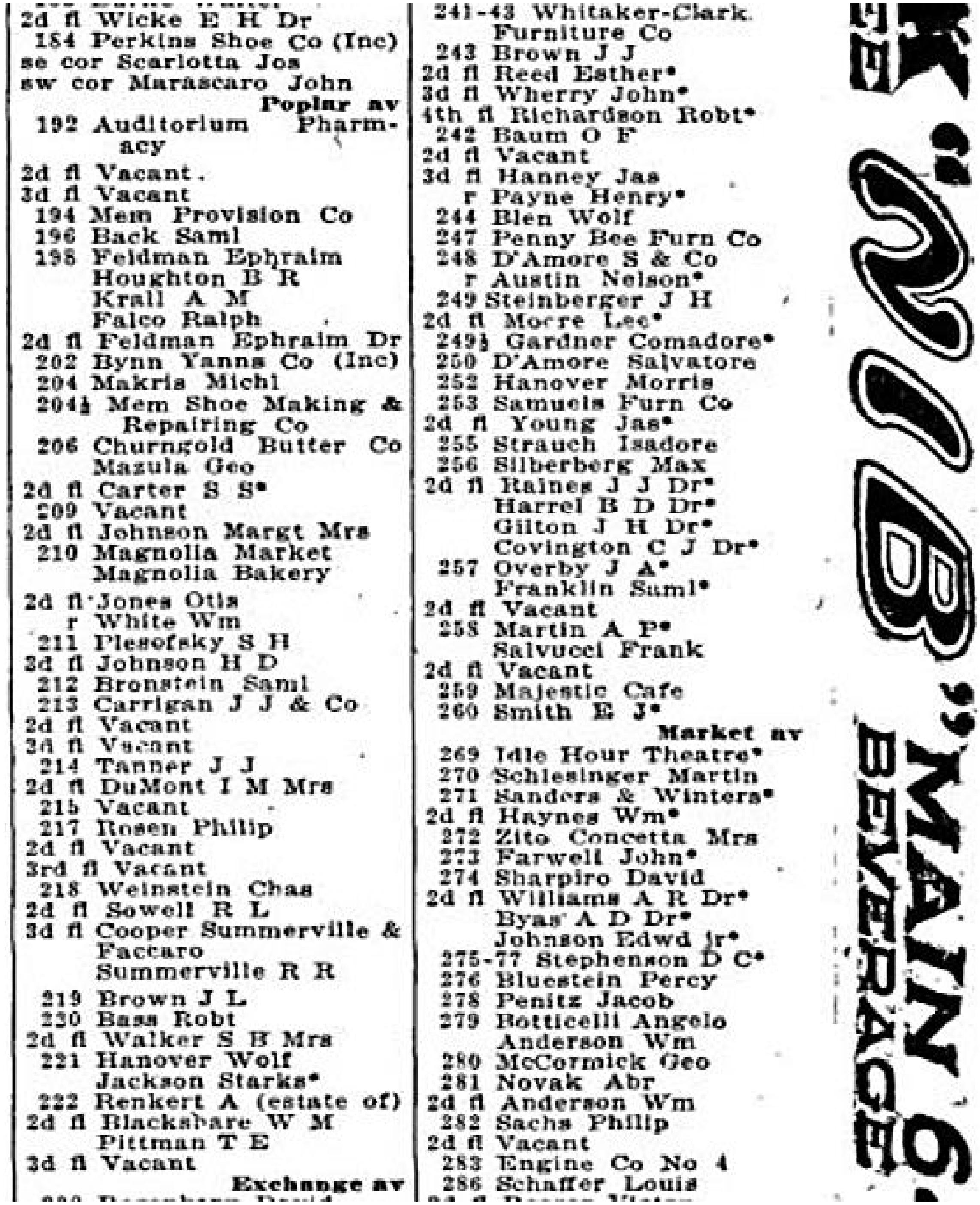


Figure 4 Sanborn Map 1907

Red outline denotes approximate site location. (Sanborn Maps)



2d fl Wicke E H Dr
184 Perkins Shoe Co (Inc)
se cor Scarlotta Jos
sw cor Marascaro John
Poplar av
192 Auditorium Pharmacy
2d fl Vacant.
3d fl Vacant
194 Mem Provision Co
196 Back Saml
198 Feldman Ephraim
Houghton B R
Krall A M
Falco Ralph
2d fl Feldman Ephraim Dr
202 Bynn Yanns Co (Inc)
204 Makris Michl
204½ Mem Shoe Making & Repairing Co
206 Churngold Butter Co
Mazula Geo
2d fl Carter S S*
209 Vacant
2d fl Johnson Margt Mrs
210 Magnolia Market
Magnolia Bakery
2d fl Jones Otis
r White Wm
211 Plesofsky S H
3d fl Johnson H D
212 Bronstein Saml
213 Carrigan J J & Co
2d fl Vacant
3d fl Vacant
214 Tanner J J
2d fl DuMont I M Mrs
215 Vacant
217 Rosen Philip
2d fl Vacant
3rd fl Vacant
218 Weinstein Chas
2d fl Sowell R L
3d fl Cooper Summerville & Faccaro
Summerville R R
219 Brown J L
220 Bass Robt
2d fl Walker S H Mrs
221 Hanover Wolf
Jackson Starks*
222 Renkert A (estate of)
2d fl Blackshare W M
Pittman T E
3d fl Vacant
Exchange av
241-43 Whitaker-Clark Furniture Co
243 Brown J J
2d fl Reed Esther*
3d fl Wherry John*
4th fl Richardson Robt*
242 Baum O F
2d fl Vacant
3d fl Hanney Jas
r Payne Henry*
244 Bien Wolf
247 Penny Bee Furn Co
248 D'Amore S & Co
r Austin Nelson*
249 Steinberger J H
2d fl Moore Lee*
249½ Gardner Comadore*
250 D'Amore Salvatore
252 Hanover Morris
253 Samuels Furn Co
2d fl Young Jas*
255 Strauch Isadore
256 Silberberg Max
2d fl Raines J J Dr*
Harrel B D Dr*
Gilton J H Dr*
Covington C J Dr*
257 Overby J A*
Franklin Saml*
2d fl Vacant
258 Martin A P*
Salvucci Frank
2d fl Vacant
259 Majestic Cafe
260 Smith E J*
Market av
269 Idle Hour Theatre*
270 Schlesinger Martin
271 Sanders & Winters*
2d fl Haynes Wm*
272 Zito Concetta Mrs
273 Farwell John*
274 Sharpiro David
2d fl Williams A R Dr*
Byas A D Dr*
Johnson Edwd jr*
275-77 Stephenson D C*
276 Bluestein Percy
278 Penitz Jacob
279 Botticelli Angelo
Anderson Wm
280 McCormick Geo
281 Novak Abr
2d fl Anderson Wm
282 Sachs Philip
2d fl Vacant
283 Engine Co No 4
286 Schaffer Louis

Figure 5 Memphis City Directory

Polk 1920 (Shelby County Directory, Polk 1920: 1752)

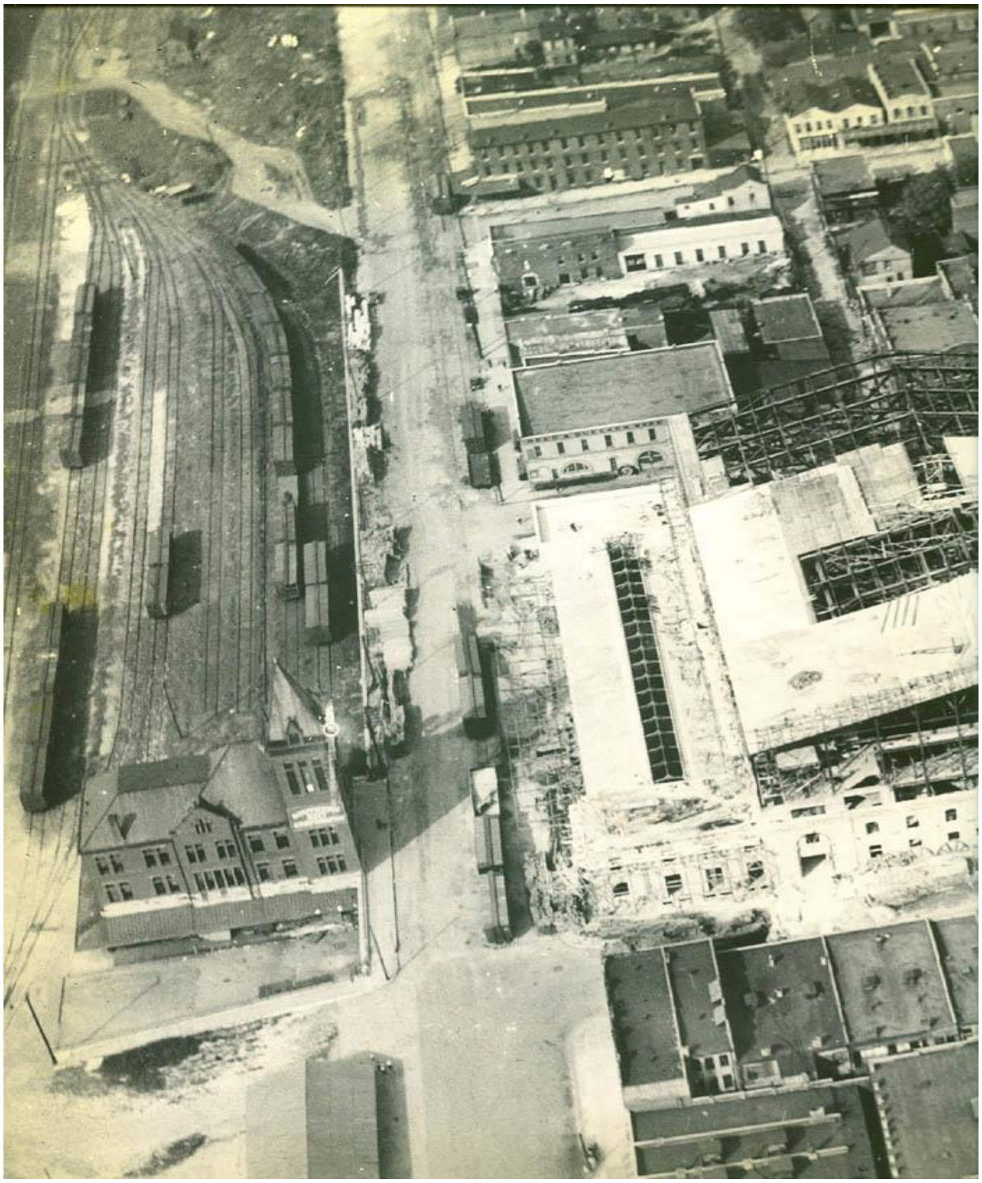


Figure 6 Ellis Auditorium

Under construction circa 1924 (http://www.mallofmemphis.org/images//ellis1924.jpg)

In addition to the human skeletal remains recovered at the MRFC collection site, various historic-period artifacts were found. One brick (see Figure 7) and over 200 glass fragments of various colors (Table 1) were collected. No maker's marks, seams, or distinguishing engraving, stamping, or embossing was observed on any of the artifacts.

Figure 7 Historic Brick

Table 1 Historic Glass

Type	N	Total Weight (Grams)
Clear sheet	209	365
Aqua sheet	20	57
Aqua bottle	3	11
Clear bottle/vessel	6	66

According to the Society for Historical Archaeology, aqua glass dates approximately from the early 19th century to the 1920s, with clear glass being rare before the 1870s and quite common by the 1910s (https://sha.org/bottle/colors.htm). Given this information, the glass color dates support the assumption that the MRFC collection likely dates from the late 19th to early 20th century, supporting the conclusion that it was buried before the Ellis Auditorium was constructed in the 1920s.

Furthermore, using Moir's (1987) glass thickness dating formula, the estimated age of the clear glass is 1876 and the aqua marine glass is 1879. The formula for the clear glass calculation is as follows: 84.22 x 1.945213 (average glass thickness in millimeters) + 1712.7 = 1876.298. The formula for the aqua marine glass calculation is: 84.22 x 1.980909 (average glass thickness in millimeters) + 1712.7 = 1879.5321. These dates further support the late 19th/early 20th century date estimation for the MRFC collection.

Additionally, it appears the single brick found is likely a handmade sand-struck or water-stuck brick (Gurke, 1987: 99-100, 104). According to South's brick index, the MRFC brick has a score of approximately 106, which would date this brick to the 18th century (South 1964:70). However, based on Atkinson and Elliot's (1978) brick index comparison from Mississippi, this brick likely dates to the early 20th century. Furthermore, considering the degradation and lack of maker's mark on the brick, and given the loose context of the find and the possibility of brick salvage and reuse, its accuracy as a diagnostic artifact is problematic. In short, there is nothing in the limited artifactual assemblage to suggest that the osteological assemblage dates to any date before or after the late 19th-early 20th century date suggested by historical records of the area.

CHAPTER II

LITERATURE REVIEW

This literature review briefly discusses biocultural theory and perspective in regard to the bioarchaeological field, past research relating to 19th century "structural violence" in the United States, and bioarchaeological investigations and methods related specifically to commingled human skeletal remains. I also provide a brief description of skeletal collections on which pathological traits have been used to study past human behavior contemporary with the MRFC collection (including two comparative collections that will be referenced in this thesis). A brief review of anatomical law in the U.S. and its impacts on medical dissection practices also is provided. All of these topics pertain directly or indirectly to analysis and/or interpretation of the MRFC collection.

To begin, various researches have focused their archaeological efforts on 19th century slave and former slave populations in the United States. Angel et al. (1987) analyzed an early 19th century free African American cemetery, the First African Baptist Church, located in Philadelphia, Pennsylvania, and compared it to a roughly contemporary slave cemetery, the Catoctin Furnace in Maryland. Osteological evidence obtained during this work suggested to the researchers that the free African Americans in Philadelphia had difficult lives filled with disease, such as tuberculosis, hyperostosis, etc., and lacked proper nutrition, showing evidence of anemia. The researchers also noted a higher rate of arthritis and trauma in the enslaved samples compared to the free samples (Angel et al., 1987:219-224).

Furthermore, Rathbun (1987) studied the health of a mid-19th century slave sample from a South Carolina plantation (38CH778). Using radiographic, metric, and visual qualitative techniques, Rathbun (1987:240-249) identified skeletal attributes, such as the identification of cribra orbitalia, which suggested that individuals had been both anemic and subject to heavy workloads. Similarly, Owsley et al. (1987:187-195) used radiographically identified lesions, contemporary census data, and visual identification of skeletal pathology to generate demographic data for the first official cemetery to be established in New Orleans, Louisiana (St. Peter's Street Cemetery [16OR92]).

In addition to African American slave cemetery studies, a number of researchers have investigated another marginalized group of people, the inhabitants of 19th century poorhouses (Lanphear, 1988; Steegman, 1991). Archaeologists investigated one particularly interesting poorhouse cemetery just outside Rochester, New York (Lanphear, 1988; Lanphear, 1990; Phillips, 2001). Like many of her peers and predecessors, Lanphear (1988:90-96,135-146) made a notable effort to determine the causes of mortality in this sample by using both osteological data and historical records. The author used chi-square testing of pathology occurrence generated from Monroe County mortality records and skeletal data to show that there was no significant difference in the distribution of life expectancy, death by age, sex or survivorship between the life table generated from the skeletal data and disease specific mortality registration records (historical data) (Lanphear, 1988:146-157,198-202). Such melding of historical and osteological data is a common practice amongst researchers who conduct historic cemetery analysis (e.g., Grauer and McNamara, 1995; Harl et al., 1996; Kelley and Angel, 1987; Owsley et al., 1987; Rathbun, 1987; Wilson, 2005) and reflects the biocultural perspective implemented in bioarchaeology.

For the purposes of this study, a biocultural perspective will be used. The biological data (sex, stature, pathology, etc.) acquired from this collection will be interpreted in combination with the cultural data (skeletal modification, burial context, historical records) within the confines of biocultural theory. While the definition of the biocultural approach to bioarchaeology has changed over the last thirty years, Zuckerman and Armelagos (2011:20) outline the approach as, "…explicitly emphasiz[ing] the dynamic interaction between humans and their larger social, cultural, and physical environments. Human variability is viewed as a function of responsiveness to factors within this larger environment that both mediate and produce each other; effectively, biology and culture are held dialectically intertwined." In other words, biocultural theory treats biological, environmental, and cultural factors as being interdependent in the analysis of bioarchaeological data.

Furthermore, biocultural theory can and has been used to research the impacts of political, historical, and sociocultural systems on the biological processes of human sample groups (Goodman and Leatherman, 1998; Zuckerman, 2011). In contrast to a more descriptive approach (e.g., focusing on topics related to degree and presence of a specific pathology in a given context), bioculturally focused bioarchaeological research emphasizes investigating pathological patterns caused by the impact of ecological, political, and social systems on mortality and morbidity in populations (Goodman and Leatherman, 1998; Zuckerman, 2011).

When one attempts to study human skeletal remains, a significant problem occasionally presents itself: skeletal commingling. Osterholtz (2014:8) defines commingling as, "Human (or faunal, or mixture of both) remains that have become indistinguishable as individuals due to mixing of elements, either intentionally or unintentionally." Commingling of human remains can be highly problematic for bioarchaeological analysis. Commingled collections often consist of fragmentary elements (Osterholtz, 2014:8), which can be more difficult to identify than intact elements because the fragments may lack identifiable features. Additionally, commingling can make association of elements to specific individuals difficult, especially if the remains of many individuals are present. Also, cross-disciplinary knowledge is usually required to analyze commingled remains because they are frequently mixed with faunal skeletal remains (Baustian et al., 2014: 269).

One of the few studies involving commingled human remains from the early 20th century is the Music Hall skeletal collection from Cincinnati, Ohio (Murray, 1993). In brief, Murray and others analyzed approximately 200 pounds of commingled human remains found in an elevator shaft that were determined to have been entombed before 1927 (Murray, 1993). After a formal inventory, it was concluded that not one complete individual was present in the collection (Murray, 1993:64). Similar to what may have heavily impacted the MRFC collection, Murray describes this lack of completeness as a product of taphonomic processes, insufficient archaeological recovery, and theft of some boney elements (Murray, 1993:67-68). She compensated for some of these pitfalls by using osteometrics to determine sex from some discrete elements in order to create a table of "sex ratios," which she then used to compare statistically the osteological data to historic census data (Murray, 1993:105-116). As Murray demonstrates, even though a sample is commingled and highly fragmented, like the MRFC collection, useful osteological data can still be acquired.

Furthermore, multiple more recent methods of analyzing commingled skeletal remains have been developed and implemented (Adams and Byrd, 2008; Harrington and Blakely, 1995b; Herrmann and Devlin, 2008; Osterholtz et al., 2014). To give a few examples, Herrmann et al. (2014) used a GIS approach partnered with fragment digitization, MNE (minimum number of element) estimation, and bone color scoring to create an MNI estimation of the Walker-Noe crematory site in Kentucky. Osterholtz et al (2014) used a feature-based (skeletal landmark) method focusing on bone density and identifying different types of bone (e.g. spongy, cortical, etc.) for determining MNI of the Tell Abraq collection from the United Arab Emirates; and Zejdlik (2014) discussed the use of field and lab photography to sort out commingled museum collections. As one can see, there are various ways one can analyze commingled skeletal collections. However, as Osterholtz points out, "There is no *right way* to analyze a commingled assemblage" (2014:1); there are only best practices (Osterholtz, 2014:1) that need to be made explicit.

To understand adequately how medical dissection could be a result of "structural violence," one must have at least a limited understanding of the history of anatomy laws in the United States. Due to the rapid growth of medical schools in the 19th century, the demand for human anatomical remains increased (Sappol, 2002:5). At the same time, the U.S. was experiencing the economic effects of industrialization, which led to socio-economic inequalities and increased poverty. To address these two issues, laws were created in an attempt to alleviate economic hardships on the poor by providing a means for the legal procurement of the unclaimed bodies of the destitute. Ironically, these laws formally established a system in which economic inequality increased the vulnerability of impoverished groups of people (Nystrom, 2014:768).

Even though dissection was necessary for the improvement of medical science, dissection as a form of punishment was also prevalent (Nystrom, 2014:768). While the first law making dissection a form of postmortem treatment was enacted by Henry VIII of Britain in 1540, the first anatomy laws in North America that permitted the dissection of executed criminals were enacted in 1641 and 1647 (Nystrom, 2014:768; Sappol, 2002:100). Even with these laws providing an increased number of individuals for dissection, by the 19th century medical colleges were struggling to attain enough cadavers to meet demand (Nystrom 2014:768; Sappol, 2002). With this increased demand, an illegal market for "resurrected" individuals began to form (Nystrom 2014:768; Sappol, 2002:111). The illegal and clandestine grave robbing of the time created such a fear in various communities that multiple riots broke out in protest against medical colleges between 1785 and 1855 (Sappol, 2002:106). A particularly disastrous riot was the 1788 Doctor's Mob in New York City (Sappol, 2002:107). After a petition against grave robbing by a local free black community was ignored the year before, grave robbers became bolder and started removing bodies outside the Negroes Burial Ground (Sappol, 2002:107). Ironically, it was not until the bodies of white persons were targeted that major trouble ensued. Sappol describes the possible spark of the riot: "On 21 February 1788, it was reported that the body of a white woman had been stolen from the graveyard of Trinity Church; the rector of Trinity publicly offered a reward of $100 for information leading to the arrest of the perpetrators" (Sappol, 2002:107). The subsequent riot involved approximately 5,000 people and led to significant damage to the medical college and the deaths of six people (Sappol, 2002:108).

In response to these events, the New York state legislature passed the "Act to Prevent the Odious Practice of Digging up and Removing for the Purpose of Dissection, Dead Bodies Interred in Cemeteries or Burial Places," the first law to regulate dissection in the U.S. (Sappol, 2002:109). With this law, body snatching was outlawed and made punishable by a fine and imprisonment as determined by the presiding judge. However, in an attempt to prevent disruption of scientific advancement, judges were empowered to sentence individuals found guilty of murder, burglary, and arson to medical dissection following their execution or death while in incarceration (Sappol, 2002:109), thus instituting post-mortem dissection as a form of punishment via knowledge imparted to the living about the ultimate fate of their mortal remains.

By the early 1820's, anatomy laws began to be passed allowing medical colleges to receive unclaimed bodies from almshouses (Nystrom 2014:769). In New York, the "Act to Promote Medical Science and Protect Burial Grounds," also known as the "Bone Bill," was passed in 1854 (Sappol, 2002:105). Superficially, anatomy laws were intended to promote legal scientific medical advancement and to stop grave robbing. However, the laws also made dissection a "…deterrent against indigence and as a means of social control" (Nystrom, 2014:769).

As stated previously in this thesis, "structural violence" is a political, cultural, economic, or religious construct that adversely impacts an individual's or group's full potential (Farmer et al., 2006; Galtung, 1969). These acts of violence can be seen on the human skeleton as skeletal indicators indicative of pre-mortem physiological stress, diet, and activity patterns or post-mortem treatment (e.g., dissection cutting) (Nystrom 2014:766). These adverse impacts are seen as structural because they are engrained in the economic and political organization of a culture; they are seen as violent because they promote violence toward people (Farmer et al., 2006:1686). As researchers, we can see such institutionalized violence in both modern (e.g., Farmer et al., 2006) and older human skeletal samples (e.g., Dougherty and Sullivan, 2017; Grauer and McNamara, 1995; Grauer et al., 1999; Grauer et al. 2017; Halling and Seidemann, 2017; Hodge et al., 2017; Lanphear, 1988; Lanphear, 1990; Lowe 2017; Muller et al., 2017; Nystrom 2014; Owsley, 1995; Richards et al., 2017).

In regard to structural violence in historic bioarchaeological research, there has been a growing body of investigations centered on 19th century poor houses and alms houses in the United States (e.g., Grauer et al., 1999; Higgins et al., 2002; Higgins and Sirianni, 1995; Sutter, 1995). Many skeletal collections deriving from alms house sites (e.g., Blockley Almshouse [Crist et al., 2017], Dunning Poorhouse [Grauer et al., 2017], Erie County Poorhouse [Nystrom and Mackey, 2014], and Milwaukee County Poorhouse [Doughtery and Sullivan, 2017]) have elements that show signs of postmortem modification; a few even have a documented history of individuals being exploited by local medical colleges for educational dissection (e.g., Crist et al., 2017:263). Not surprisingly, a number of 19th century U.S. medical college collections also show indications of structural violence (e.g., Harrington and Blakely, 1995a; 1995b; Hodge et al., 2017) such as dissection cutting of the long bones, sacrum, and cranium (Halling and Seidemann, 2017:177; Owsley et al., 2017:152). Given what we know of anatomical laws and the pressing need for increased procurement of anatomical specimens in the 19th century (Sappol 2002), this fact is not surprising.

Comparative Collections Background

Providence Baptist Church Cemetery: Memphis, Tennessee (1899-1933)

In 2003, this unmarked historic African American cemetery was uncovered while airport runway construction was underway at the Memphis-Shelby County Airport (Wilson, 2005:1). In total, 39 adults (21 male and 18 female) and 23 sub-adults were found (Wilson, 2005:64). Compared to other, contemporary sites, the Providence Baptist Church Cemetery sample shows few osteological stress indicators (Wilson, 2005:69). This collection does have a high rate of degenerative joint disease, however, along with occurrences of treponemal infection, trauma, sinusitis, congenital scoliosis, periostitis, and cribra orbitalia (Wilson, 2005:69-97). This collection is important for this thesis because it provides roughly contemporary (1899-1933) osteoarthritis data for a rural human skeletal collection also located near Memphis, Tennessee.

9CH875 (Hunter Army Airfield): Chatham County, Georgia (ca. 1870s-1910s)

The discovery of two previously forgotten cemeteries on the Hunter Army Airfield (HAAF) property initiated the excavation of the First Zion Baptist Church cemetery (9CH1168) and an unnamed second cemetery (9CH875). These investigations were conducted between March 2007 and August 2008. Primarily due to its larger sample size (Matternes et al., 2010:1), the 9CH875 cemetery was chosen over 9CH116 as a comparative sample for the MRFC collection. It contained 346 African American individuals, with 90 individuals being identified as female and 68 identified as male

(Matternes et al., 2010:88,124). Pathological indicators discovered include, but are not limited to, cortical thinning, cartilage ossification, degeneration, and physical injuries (Matternes et al., 2010:141-148). The approximately contemporaneous nature (ca. 1870s-1910s), large sample size, and association with an urban location (Savannah, Georgia) is why it was chosen as a primary comparative collection for this thesis.

Medical College of Georgia: Augusta, Georgia (1835-1912)

The Medical College of Georgia collection was chosen for comparative study because it represents a contemporary and regionally similar commingled collection that also has a high degree of surgical cut marks. In the fall of 1989, during renovation of the old Medical College of Georgia building, construction workers uncovered human skeletal remains in the earthen basement floor. After this discovery, Robert Blakely at Georgia State University was contacted and recovery efforts were initiated. This excavation removed approximately 300 animal bones, 2,000 artifacts, and over 9,000 human skeletal elements (Harrington and Blakely, 1995a:3).

According to historical records (reviewed by Harrington and Blakely, 1995a), the original Medical College of Georgia building was the only active teaching facility for the college between the years 1835 to 1912. During most of the 19th century, the building was used for medical dissection and as a teaching laboratory. Due to the illegality of dissection in Georgia at the time (until 1887), this practice was conducted secretly. While a few cadavers were purchased from other large cities, most were acquired locally (Harrington and Blakely, 1995a:3,5). These dissections and the consequent cut marks they left on the bone are what make this collection the optimal cut mark comparative sample for the MRFC collection.

CHAPTER III

HYPOTHESES

H_{0a}: The mortality structure of the MRFC osteological collection will be similar to the contemporary mortality patterns for cadavers turned over to a medical college in Memphis, Tennessee.

H_{1a}: The mortality structure of the MRFC osteological collection will be different from the contemporary mortality pattern for cadavers turned over to a medical college in Memphis, Tennessee.

H_{0b}: The frequency of demonstrably postmortem modification (sawing, drilling, and cutting) seen on the MRFC collection is not significantly greater than contemporary historic collections.

H_{1b}: The frequency of demonstrably postmortem modification (sawing, drilling, and cutting) seen on the MRFC collection is significantly greater than contemporary historic collections.

H_{0c}: Given that the MRFC collection was excavated in downtown Memphis, the skeletal collection will exhibit pathological conditions indicative of contemporary "urban" populations.

H_{1c}: Although the MRFC collection was excavated in downtown Memphis, the skeletal collection will exhibit pathological conditions that are not consistent with contemporary "urban" populations.

CHAPTER IV

METHODS

The guidelines used for element identification of the MRFC remains were primarily taken from a series of human osteology reference textbooks (Bass, 1995; White and Folkens 2000, 2005), while the *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker, 1994) provide the systematic assessment methods for sex, age and stature determination as well as pathology and trauma descriptions.

Once identified, elements were given a unique bone identification number (e.g., Femur 1) and were subsequently logged into a Microsoft Access Database. Comments, pathology codes, and general observations were logged into this database for each individual element. Even for this relatively small collection, this queryable database made data management better organized and accessible.

Discussion of Comparative Pathological Methods

Due to the commingled nature of the MRFC osteological collection, simply calculating pathological prevalence rates by minimum number of individuals (MNI) will not suffice for a comparative study. Prevalence is defined as the number of cases affected, divided by the total population (Waldron, 1994: 43). In this case, prevalence would be determined by dividing the number of cases affected by the total sample, rather than the total population. It would only be possible to determine prevalence accurately when one used the summation of all of one type of bone or the total of one type of joint as the denominator, and the sum of afflicted joints or bones as the numerator (Waldron, 1994: 55).

Considering the limitations of this commingled collection, chi- square tests were used where statistically appropriate to determine whether the frequency of occurrence of predetermined pathological stress indicators (e.g., osteoarthritis, or OA) is significantly different from that in comparison samples (Lanphear, 1988). By comparing the severity of stressors between assemblages, one should be able to measure variance between said samples. For example, a chi-square test was conducted to assess relationships between OA-affected vertebrae from different sites to determine whether there were any disparities or statistical similarities between samples. From such comparisons, we can determine different behaviors or possible environmental stressors.

In addition, to accurately investigate the urban versus rural hypothesis, a chi-square test based on OA occurrence is necessary (Agresti and Finlay, 2009:224). For samples that had too few occurrences for comparison, a Fisher's exact test is employed to note any statistical difference. Due to the small sample size, all sexes, ages, and severities were included and not differentiated for these tests. All tests were run in the R-statistics program using the R-commander package (2015).

Furthermore, to contribute to the understanding of this collection, the frequencies of cut marks by element are compared statistically using a Chi-squared test and a Fisher's exact test between the MRFC collection and the Medical College of Georgia collection (Harrington and Blakely, 1995a). These tests were completed with no differentiation between sex, ancestry, age, or severity. All tests were run in R- statistics program using the R-commander package (2015).

CHAPTER V

RESULTS

Biological Profile

For the purposes of this research, a biological profile is a set of characteristics an individual(s) had while alive that can be determined from skeletal remains. As briefly mentioned above, this list includes: sex, age at death, ancestry, stature, and pathology (Steadman and Anderson, 2009:8). The data obtained based on these characteristics were used to create comparative data sets, which were used to test the three hypotheses.

Collection Description

The MRFC collection consists of approximately 409 commingled skeletal elements, with various degrees of fragmentation and pathology. This section provides information on the estimated minimum number of individuals (MNI), age, sex, race, and stature of elements/individuals in this collection.

Minimum number of individuals

Determining MNI is done by counting the frequency of unique elements found in the human body and making an assumption about the number of represented individuals in a collection. For example, a typical human would only have one right radius, which would be a unique element in the human body. By counting the highest frequency of these uniquely occurring elements, a researcher can determine the number of individuals in a collection. The minimum number of individuals (MNI) for the MRFC collection is twenty. This is based upon the twenty identifiable left femurs (See Appendix Inventory Master).

Age at death

Due to the commingled and fragmentary nature of this collection, only elements with established age-at-death indicators could be used. For this study, the mostly intact crania were used to determine the general age-at-death for the collection, focusing primarily on their dentition eruption rates. Cranium 345 had erupted third molars, which is an indicator of an individual reaching at least approximately 20 years of age. Cranium 344 showed signs of only partial third molar eruption, indicating an age estimation of 15 +/-3 years. Cranium 343 showed no signs of third molar eruption. However, all other dentition is fully erupted and developed. The likelihood that cranium 343 is approximately 15 +/-3 years is high (Buikstra and Ubelaker, 1994: 51; Ubelaker, 1989). Furthermore, three mandibles were intact enough for their dentition to be aged. Mandible 329 had one erupted third molar, which suggested an approximate age of early twenties or possibly late teens (approximately 21 years). Mandible 328 had no erupted third molars, which is characteristic of sub-adulthood. However, all other dentition had erupted. Therefore, it is likely that this mandible represented an individual of very early adulthood or late teenage years. Similar to Mandible 328, Mandible 330 also had no erupted third molars. It is likely that Mandible 330 also represents an individual who died between his or her late teens and early twenties (Buikstra and Ubelaker, 1994: 51; Ubelaker, 1989) (See Appendix Mandible Age [Dental Eruption]).

Sex and ancestry

To determine the probable sex of individuals represented by this collection, the intact os coxae and crania were analyzed. Out of the 23 identifiable os coxae elements, only five were intact enough to be sexed. Based on the characteristics of the greater sciatic notch (see Appendix Os Coxae Sciatic Notch Inventory) of those five os coxae, all were determined to be male (White 2005:393).

Additionally, crania 343, 344, and 345 were all determined to be male. This was established by taking craniometrics (see Appendix Craniometrics) from all three crania and running those data through a Discriminate Function Analysis (DFA) program: FORDISC 3.0 (Ousley and Jantz, 2005a). To paraphrase Ousley and Jantz, Discriminant Function Analysis is a group of procedures for the statistical classification of unknowns using a series of measurements. These analyses use known membership reference categories such as age, ethnicity, or sex. New individuals of unknown category membership are then statistically compared to the known reference category data sets. A widely used DFA is the Linear Discriminant Function (LDF). The LDF changes measurements into discriminant function values using a linear series of the original measurements that enhances inter-category differences. The discriminant value of an individual of unknown category membership is then compared to the mean DFA value for each reference group; it is categorized into the class with the closest mean. If there are more than two categories, as we have with this thesis, more than one DFA value can be determined, and multiple axes are used for resolving category differences. This method is known as Canonical Variate Analysis. If more than one dimension is present, the group mean values are referred to as centroids. For this thesis and similar studies, an unknown sample data set is simply grouped into the reference category it is closest to, as based on the distance to each category's centroid using all the axes (Ousley and Jantz, 2005b:9).

For this research, the unknown data set would be the MRFC data, which was then compared to a known osteological data set (Forensic Database [FDB] and Howells skeletal collection) to determine the likelihood the MRFC data would be statistically similar to a group of known sex and ancestry (Ousley and Jantz, 2005b). The subsequent output is the likelihood a cranium shows more masculine or feminine attributes and attributes more indicative of a certain ancestry based on the sample (See Appendix FORDISC MRFC 343 Craniometrics, FORDISC MRFC 344 Craniometrics, FORDISC MRFC 345 Craniometrics). In conjunction with this statistical analysis, visual morphological attributes (nuchal crest, mastoid process, glabella prominence, etc.) of all three crania (343, 344, and 345) were determined to be likely male (Buikstra and Ubelaker, 1994:20-21).

To further explain, as can be seen in figures (See Appendix FORDISC MRFC 343 Craniometrics, FORDISC MRFC 344 Craniometrics, FORDISC MRFC 345 Craniometrics) on the canonical plots, the "x" marker represents the MRFC craniometric data (centroid) compared to the mean DFA value of each comparative group (i.e. black males, white females, etc.). To put it simply, the closer the MRFC cranial sample "x" is on the canonical plot to the centroid of a group (i.e. WM), the closer the sample is statistically to mean DFA value of the comparative data set. One can see from each plot that, based on the visual qualitative analysis and the statistical analysis, it is likely that Cranium 343 and 345 are of white or Caucasian ancestry while Cranium 344 could be a male of black or African American descent (See Appendix FORDISC MRFC 343

Craniometrics, FORDISC MRFC 344 Craniometrics, FORDISC MRFC 345 Craniometrics). Of course, mixed ancestry could also condition the placement of individual specimens in the plots.

Stature

While post-cranial metrics were taken (See MRFC Access Database), only seven long bones, likely from different indiviudals, were found to be complete enough to take a maximum length measurement (one femur, two tibia, two fibulas, one humerus, two radii , and one ulna). Accordingly, stature was not used for comparative purposes in this thesis.

Cut mark pathology

The MRFC collection has various elements that have been subjected to saw-like and bore-like cutting. To adequately address the questions in this study, it was necessary to determine whether or not the elements with cut marks present are amputated remains or just show signs of post-mortem modification (anatomical teaching/experimentation). For specific elements, the post-mortem or amputation question can be answered by looking at the location of the cut marks in relation to the other elements present in the collection. For example, it is unlikely that a femur that was amputated would have both its proximal and distal ends accounted for, especially if the elements refit. If a collection had discarded amputated remains, one could assume that there would be a disproportionate number of distal sections of long bone elements present compared to the number of proximal ends. For the MRFC collection, there does not appear to be a significantly disproportionate amount of proximal ends to distal ends represented (eight proximal and seven distal long bone sections present) (See Table 2 below). Based on these data, it appears unlikely that the MRFC collection cut elements represent live amputations.

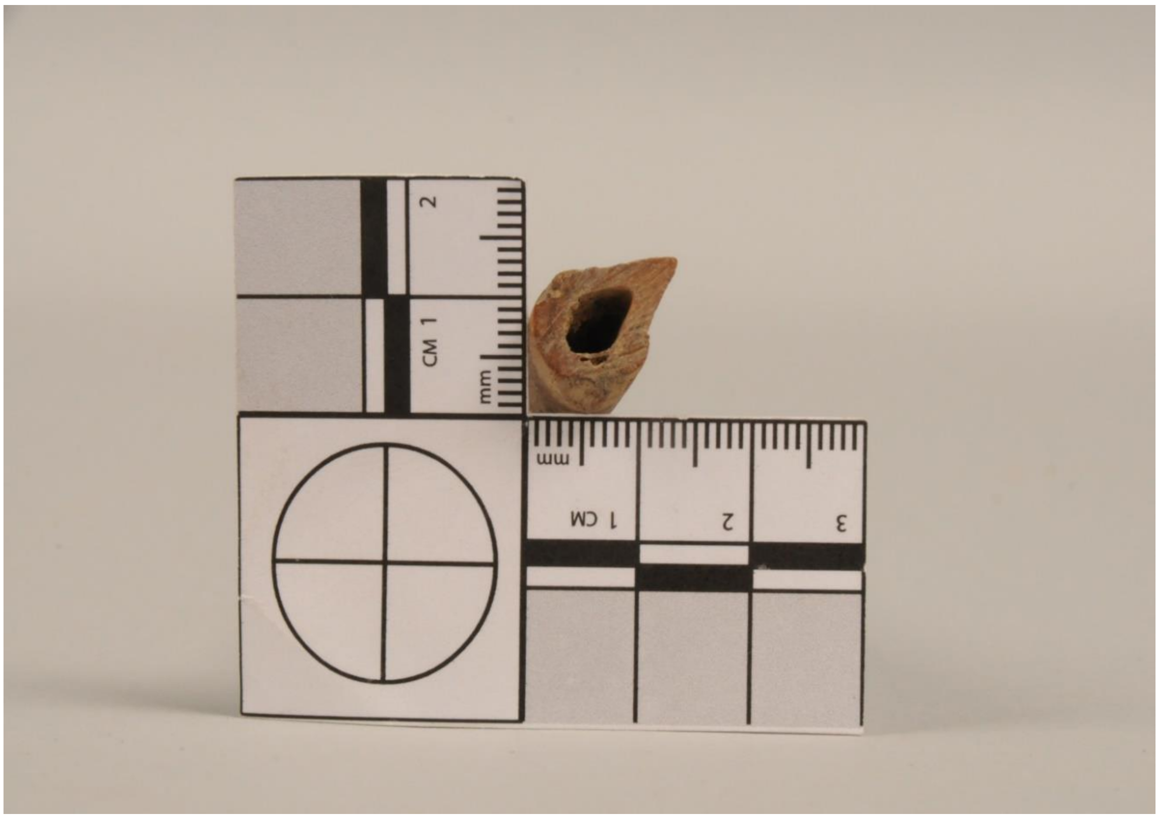


Figure 8 MRFC 84 Left Radius

Transverse Cut

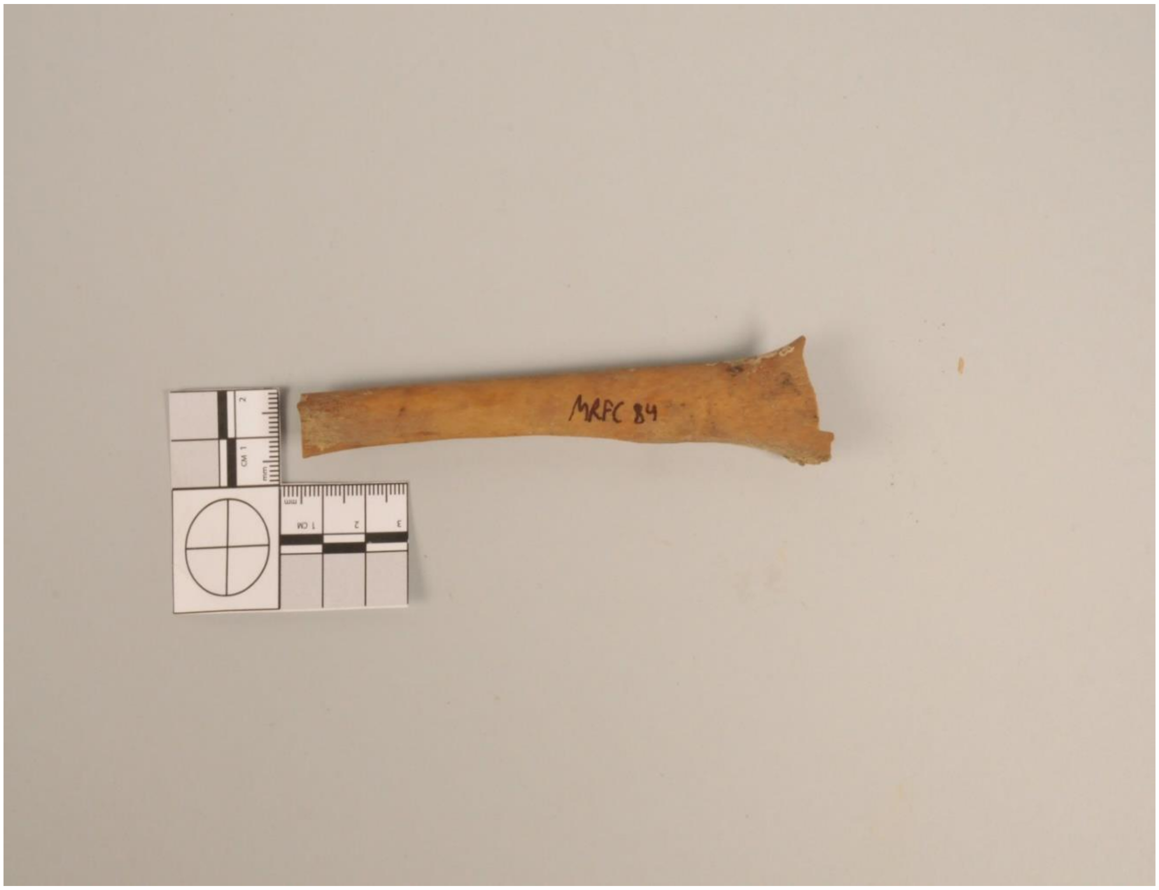


Figure 9 MRFC Left Radius

Transverse Cut

Figure 10 MRFC 344 Cranium

Circular boring on left parietal

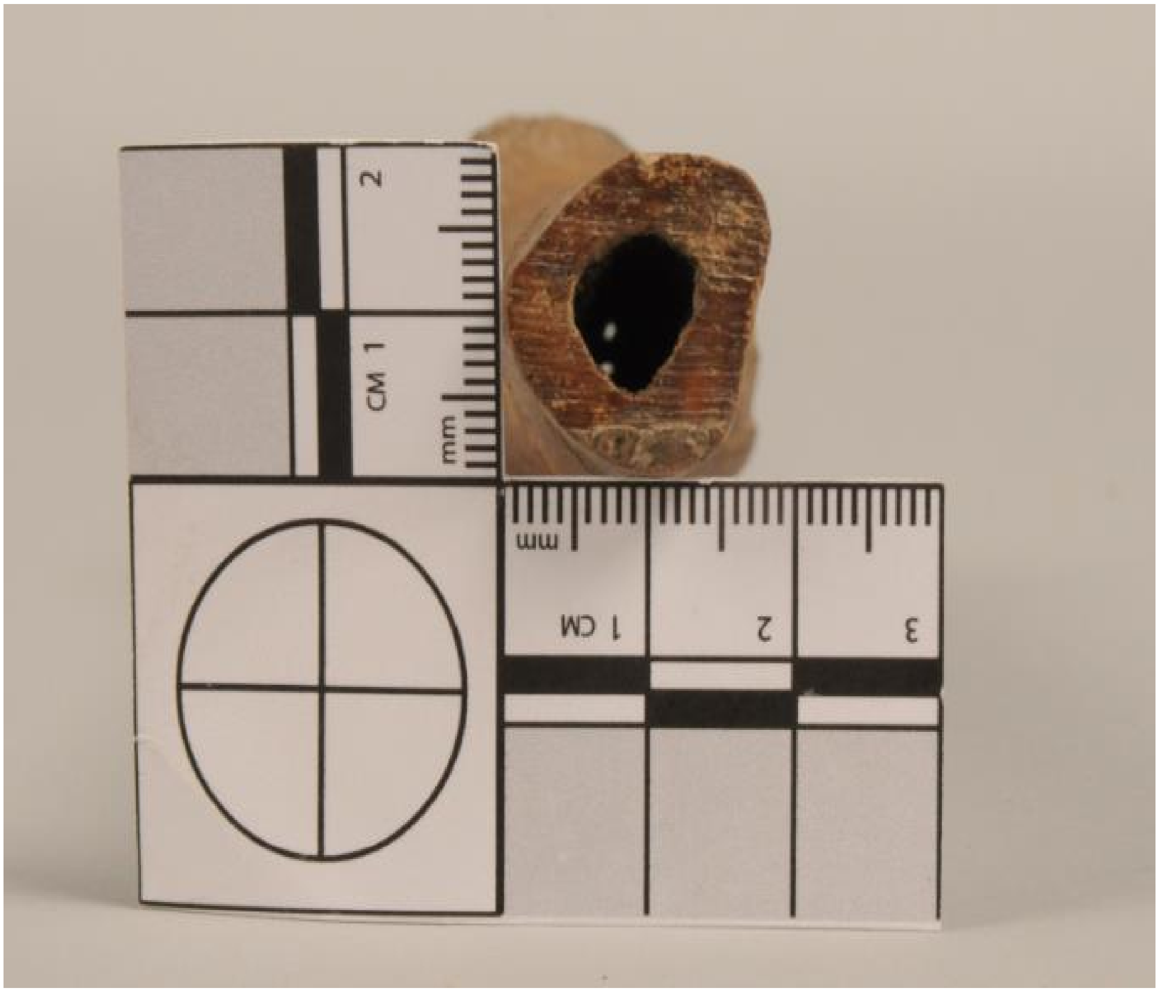


Figure 11 MRFC 80 right humerus

Transverse cut and breakage

Table 2 Long Bone Cut Locations

ID	Bone	Side	Comment	Cut Location	Remaining Section
3	Femur	R	refit to 19	Middle 1/3	Distal 1/3, Distal End
4	Femur	L		Middle 1/3	Distal 1/3, Distal End
8	Femur	L		Middle 1/3	Proximal 1/3
9	Femur	R		Middle 1/3	Proximal 1/3, Proximal End
10	Femur	L		Middle 1/3	Proximal 1/3
11	Femur	L		Distal 1/3	Middle 1/3, Proximal 1/3
16	Femur	R		Middle 1/3	Proximal 1/3
19	Femur	R	refit to 3	Middle 1/3	Proximal 1/3
40	Humerus	R		Middle 1/3	Distal 1/3, Distal End
66	Humerus	R		Middle 1/3	Distal 1/3, Distal End
76	Ulna	L		Middle 1/3	Distal 1/3, Distal End
80	Humerus	R		Middle 1/3	Proximal 1/3
84	Radius	L		Middle 1/3	Proximal 1/3
100	Tibia	R		Middle 1/3	Proximal 1/3
106	Fibula	?		Middle 1/3	Distal 1/3
134	Tibia	L		Distal 1/3	Distal End
136	Tibia	R		Proximal 1/3	Proximal End

Hypothesis A

H_{0a}: The mortality structure of the MRFC osteological collection will be similar to the contemporary mortality patterns for cadavers turned over to a medical college in Memphis, Tennessee.

H_{1a}: The mortality structure of the MRFC osteological collection will be different from the contemporary mortality pattern for cadavers turned over to a medical college in Memphis, Tennessee.

To test this hypothesis, Shelby County records were analyzed in an attempt to parse out a contemporary comparative data set to the MRFC collection. This was done by using the publicly available Shelby County death records found at: http://register.shelby.tn.us/index.php. By gathering and comparing the age-at-death entries, these records have provided this research a look into the late 19th/early 20th century mortality structure of Memphis. Given that the MFRC collection individuals were not buried in a cemetery, it was determined that only individuals listed in the records as being buried in non-mortuary contexts would be used for comparison. Specifically, individuals who had their place of burial noted as "turned over to medical college" or a similar entry would be used. Once this sample was extracted from the larger Shelby County records data set, age at death by race and sex were compared.

Records for years 1890, 1900, 1901, 1902, 1903, 1904, 1905, 1910, and 1915 were searched extensively for listed entries of individuals who were turned over to a medical institution. Only records for years 1900 and 1901 had the requisite listed data available. These data are listed below (Table 3 and Table 4).

Table 3 Shelby County Mortality Records Year 1900

Name	Age	Sex	Race	Cause of Death	Place of Death
J.H. Krenstler?	?	Male	White	Pneumonia	City Hospital
Edward Kelley	38	Male	White	Cirrhosis of liver	City Hospital
W. Meyer	74	Male	White	Senile debility	City Hospital
Mike Bodi	35	Male	White	Empyema	City Hospital

Table 3 (Continued)

J. Harrigan?	50	Male	White	Unknown	City Hospital
F. Bersey?	30	Female	White	Ulcer of stomach	City Hospital
D. Barrow	29	Male	White	Malaria?	City Hospital
G. Mardmen?	52	Male	Black	Nephritis	City Hospital
E. Woods	38	Male	Black	Congestion	City Hospital
W. Cunningham	18	Male	Black	Pneumonia	City Hospital
J. Porter	21	Male	Black	Pneumonia	City Hospital
D. Daniels	35	Male	Black	Pneumonia	City Hospital
R. Taylor	22	Male	Black	Phthisis	City Hospital
G. Smith	31	Male	Black	Pneumonia	City Hospital
L. May	49	Male	Black	Pneumonia	City Hospital
M. Winford	20	Female	Black	Gunshot wound	City Hospital
W. Lee	25	Male	Black	Tuberculosis	City Hospital
A. Nelson	49	Male	White	Nephritis	City Hospital
W. Martin	58	Male	White	Mitral regurgitation	City Hospital

Table 3 (Continued)

M. Destanano	45	Male	White	Skull fracture	City Hospital
E. Chamberlain	23	Male	White	Pneumonia	City Hospital
O. McLean	23	Male	White	Pneumonia	City Hospital
N. Ring?	47	Male	Black	Dysentery	City Hospital
L. Brown	40	Female	Black	?	City Hospital
G. Moore	19	Female	Black	Peritonitis	City Hospital
W. Hamps	24	Male	Black	Pneumonia	City Hospital
J. Wright	20	Male	Black	Nephritis	City Hospital
E. Hoppkins	19	Male	Black	Tuberculosis	City Hospital
J. Carter	19	Male	Black	Typhoid Pneumonia	City Hospital
W. Merril?	53	Male	White	Bright's disease	City Hospital
J. Perry	67	Male	White	Arteriostenosis	Anatomical
W. Anderson	25	Male	Black	Pneumonia	City Hospital
W. Jones	40	Male	Black	Nephritis	City Hospital
W. Davis	21	Male	Black	?	City Hospital

Table 3 (Continued)

D. Wilbur	24	Male	Black	Septiceamia	City Hospital
Glitton?	25	Male	Black	Apoplexy	City Hospital
Brooks?	34	Male	Black	Bronchitic asthma	City Hospital
Jones	57	Male	White	?	City Hospital
?	71	Male	White	?	City Hospital
S. Hanna	45	Male	White	Septiceamia	City Hospital
F. Flemming	24	Male	Black	Tuberculosis	City Hospital
B. Underwood	29	Female	White	Malaria	City Hospital
L. Watson	35	Male	Black	Nephritis-Dysentery	City Hospital
L. Holt	24	Female	Black	Nephritis	City Hospital
C. Johnson	50	Male	Black	Dysentery	City Hospital
Unknown	42	Male	White	Malarial Congestion	City Hospital
W. Abdill?	67	Male	White	Dysentery	City Hospital
E. Johnson	48	Male	Black	Tuberculosis	City Hospital

Table 3 (Continued)

W. ?	37	Female	Black	Nephritis	City Hospital
N. Norfleet?	21	Male	Black	Nephritis	City Hospital
M. Richardson	33	Female	Black	Apoplexy	City Hospital
W. Knox	55	Female	Black	Nephritis	City Hospital
P. Donson?	47	Male	White	Dysentery	City Hospital
A. Daily	38	Female	White	Tuberculosis	City Hospital
J. Sharpe	68	Male	White	Nephritis	City Hospital
K. Brown	25	Male	Black	?	City Hospital
G. Hill	21	Male	Black	Spinal Meningitis	City Hospital
P. Shaw	52	Male	Black	Nephritis	City Hospital
C. Booth	16	Female	Black	Nephritis	City Hospital

Table 4 Shelby County Mortality Records Year 1901

Name	Age	Sex	Race	Cause of Death	Place of Death
G. Daleu	58	Male	White	Enteritis?	City Hospital
J. ?	50	Male	White	Nephritis?	City Hospital
P. Whaleu	45	Male	White	Pneumonia/alcoholism	City Hospital
L. Boweu	36	Male	White	Pernicious anemia	City Hospital
B. Jones	30	Male	Black	Phthisis pulmonalis?	City Hospital
B. Griffin	43	Male	Black	Structure rectum/ diarrhea	City Hospital
G. Hart?	57	Male	Black	Heart disease/Nephritis	City Hospital
J. Harris	26	Male	Black	Tubercular Pneumonia	City Hospital
M. Green?	42	Male	Black	Malarial fever	City Hospital
T. Newman	40	Male	White	Fractured spine	City Hospital
Unknown	20	Male	White	Nephritis	City Hospital
N. Deagull?	23	Male	Black	Pneumonia	City Hospital
L. Daudback	85	Male	Black	Pneumonia	City Hospital

Table 4 (Continued)

B. Lind	23	Male	Black	Nephritis	City Hospital
J. Richards	35	Male	Black	Nephritis	City Hospital
M. McRay	23	Male	Black	Meningitis	City Hospital
J. Rivers	24	Male	Black	?	City Hospital
J. Bennett	38	Male	Black	Nephritis	City Hospital
J. Carter	18	Male	Black	Spinal meningitis	City Hospital
J. Henry	23	Male	Black	Pneumonia	City Hospital
J. Wincester	26	Male	White	Tuberculosis	City Hospital
R. Williams	47	Male	White	Nephritis	City Hospital
E. Jones	21	Male	Black	Phthisis pulmonalis?	City Hospital
?	41	Male	Unknown	Pneumonia	City Hospital
E. Smith	29	Male	White	Pneumonia	City Hospital
Overton	70	Male	Black	Nephritis	City Hospital
"Buffalo Bill"	20	Male	Black	Gunshot wound	City Hospital

Table 4 (Continued)

Jurcher?	41	Male	White	Malaria	City Hospital
W. Harris	28	Male	Black	Oedema of lungs	City Hospital

As can be seen in the following charts (Figures 12 to 18), entries for the years 1900 and 1901 have been combined into one dataset, subdivided into race and sex, and graphed by age of death. Notably, no females were recorded for year 1901. Therefore, the MRFC data were graphed with male samples from both sample years (Figure 19). To incorporate the MRFC data into this test, six elements were used based on probable age-at-death estimations (Crania 343, 344, and 345; Mandibles 328, 329, 330). Based on the previously determined age and sex identifications, these elements were also assumed to represent male individuals.

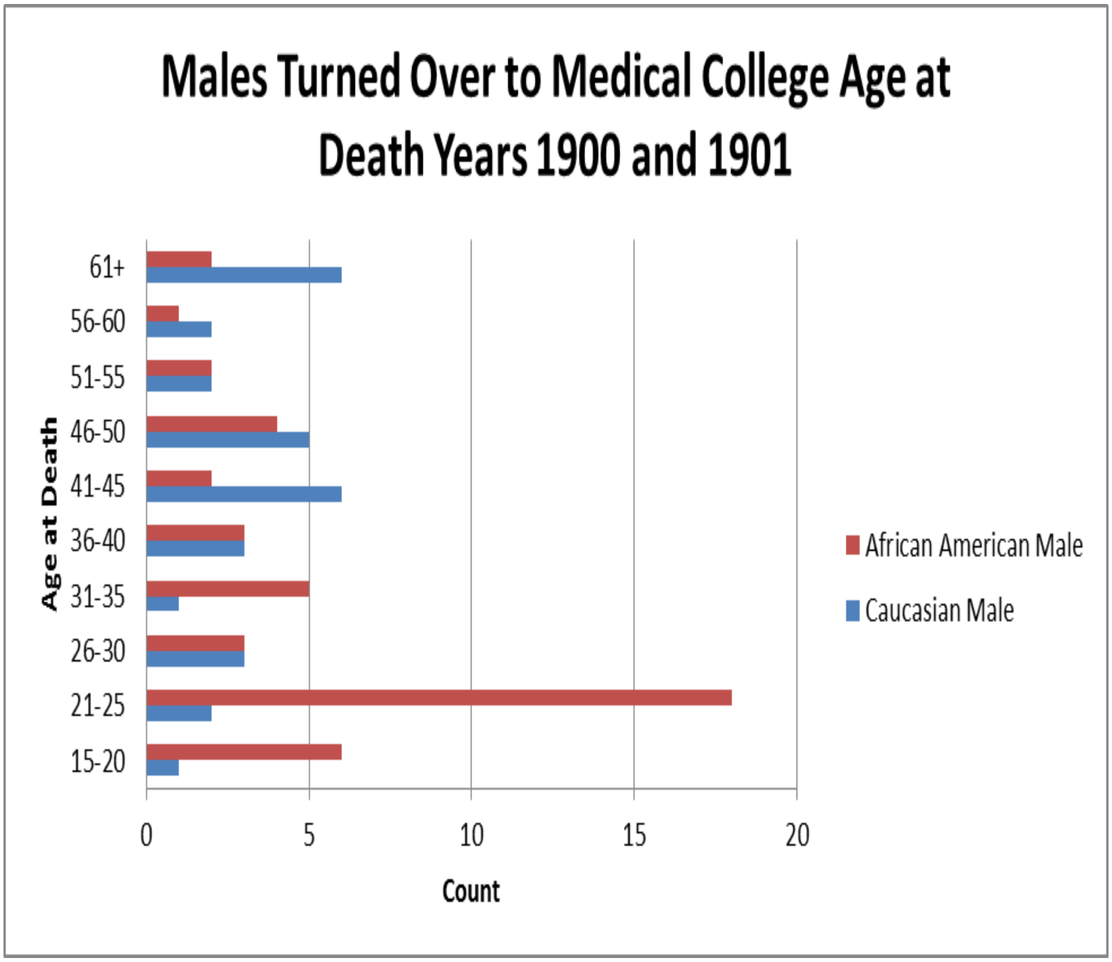


Figure 12 Males Turned Over to Medical College Age at Death

Years 1900 and 1901

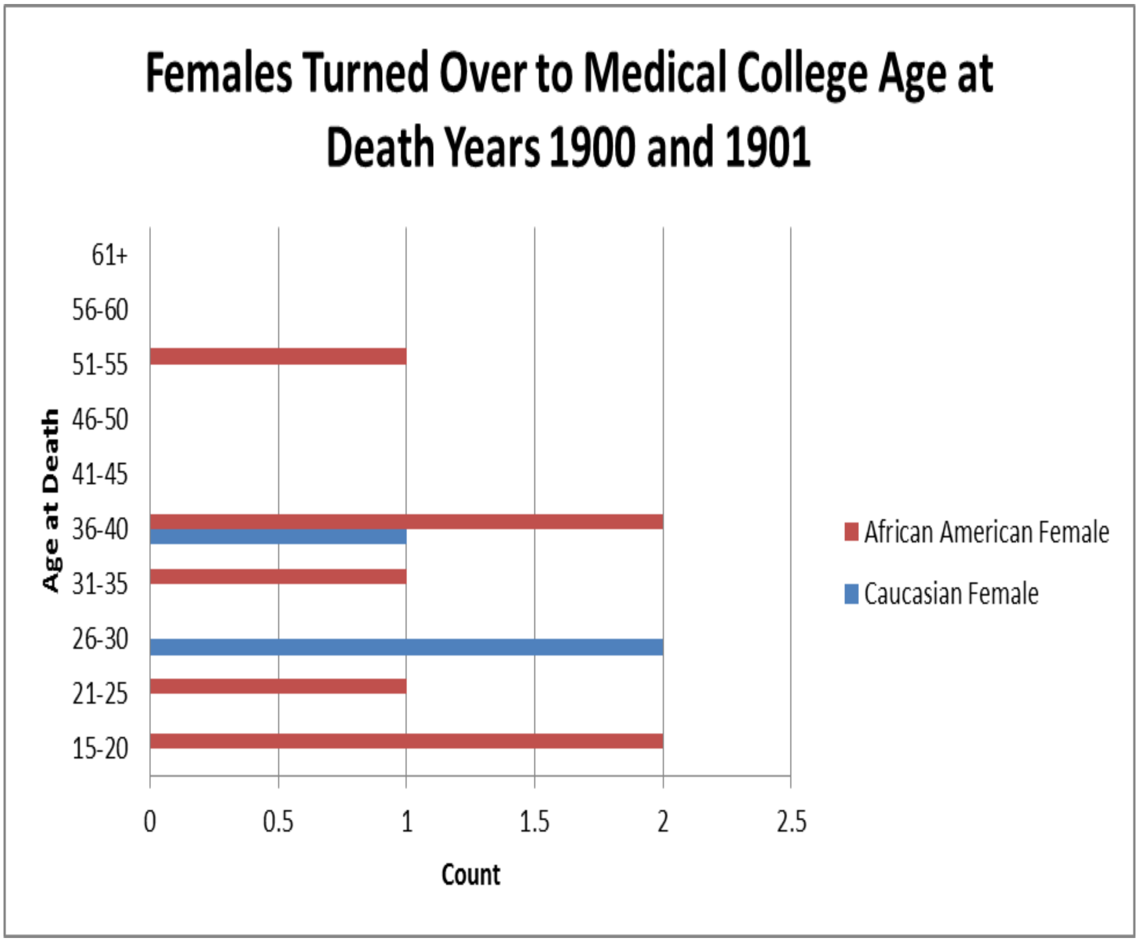


Figure 13 Females Turned Over to Medical College Age at Death

Years 1900 and 1901

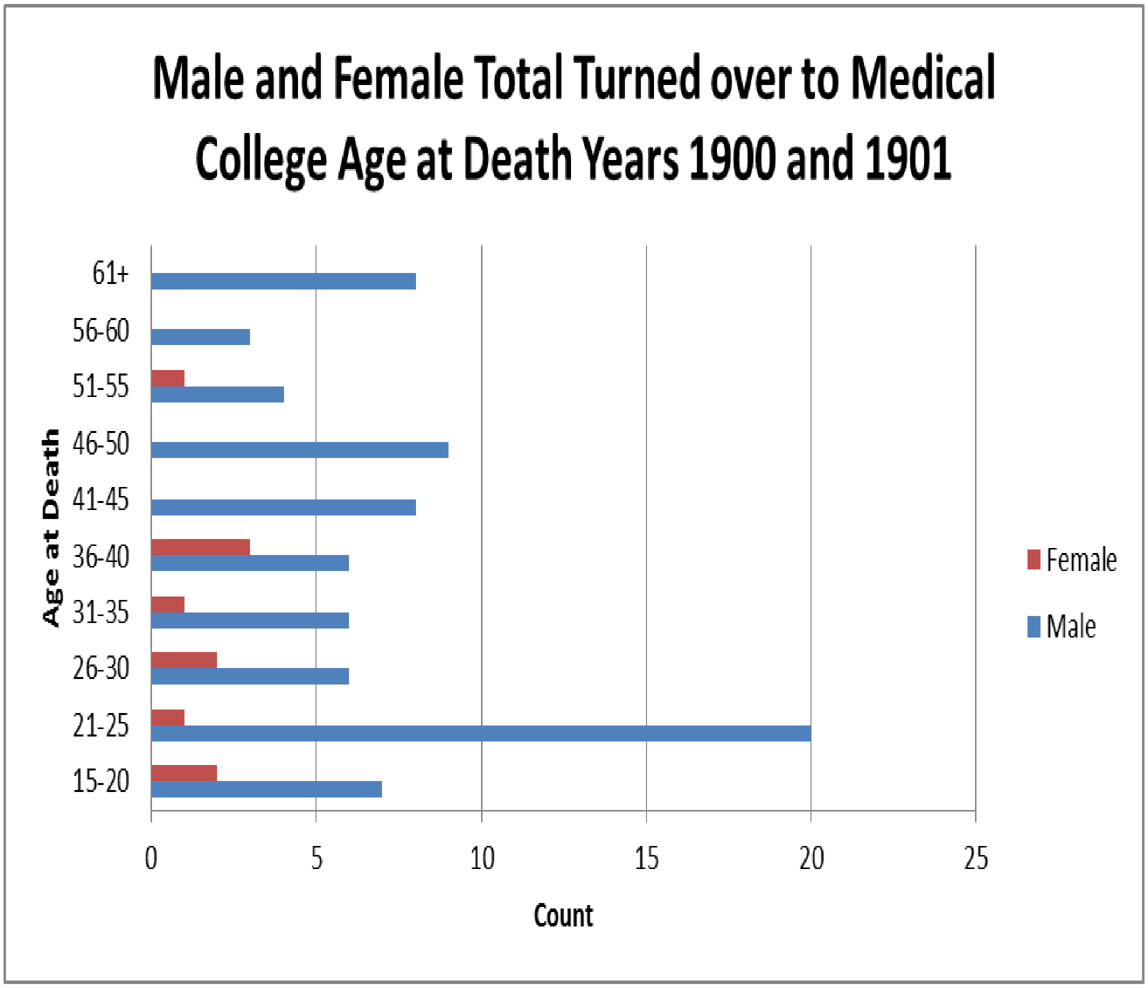


Figure 14 Male and Female Total Turned Over to Medical College Age at Death Years 1900 and 1901

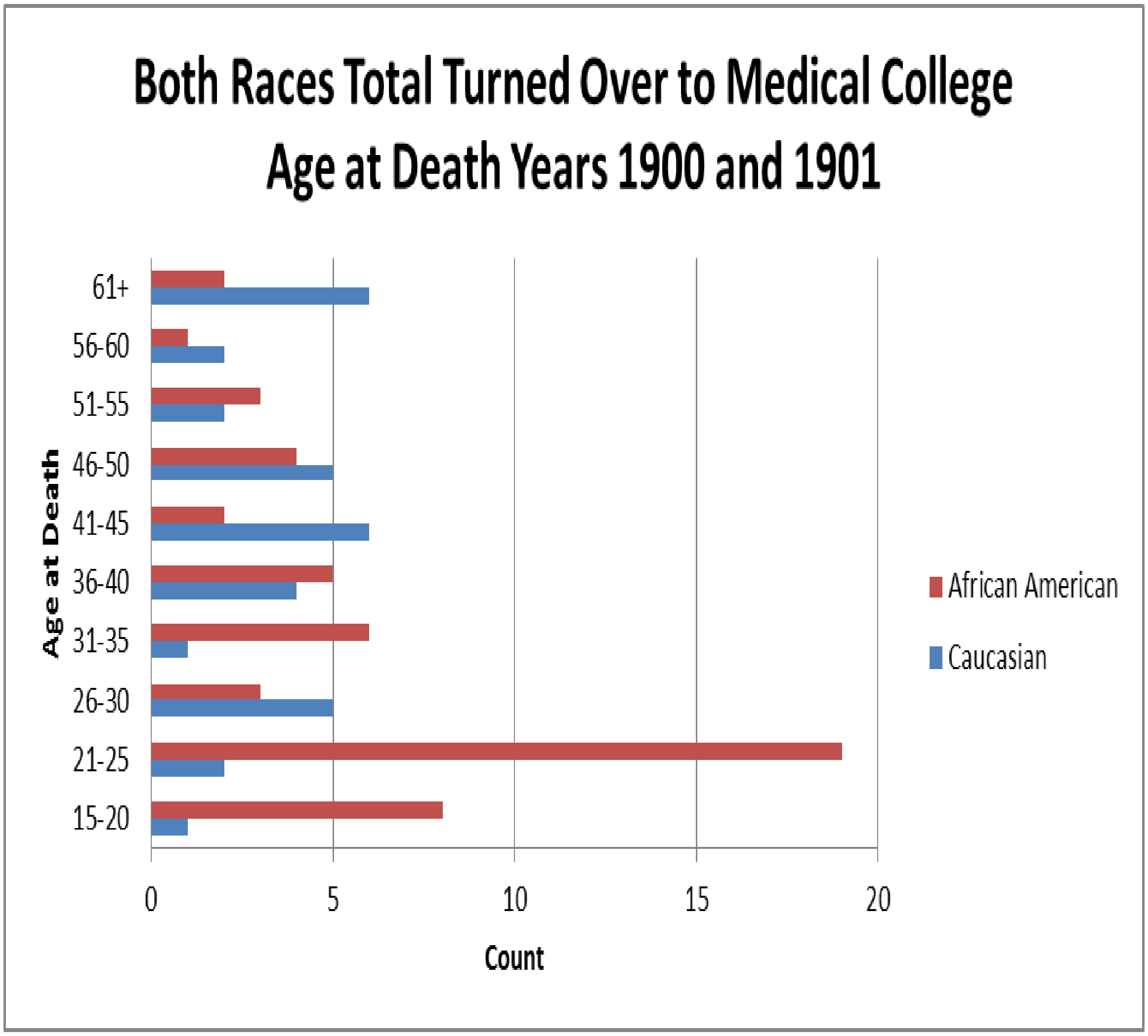


Figure 15 Both Races Total Turned Over to Medical College Age at Death Years 1900 and 1901

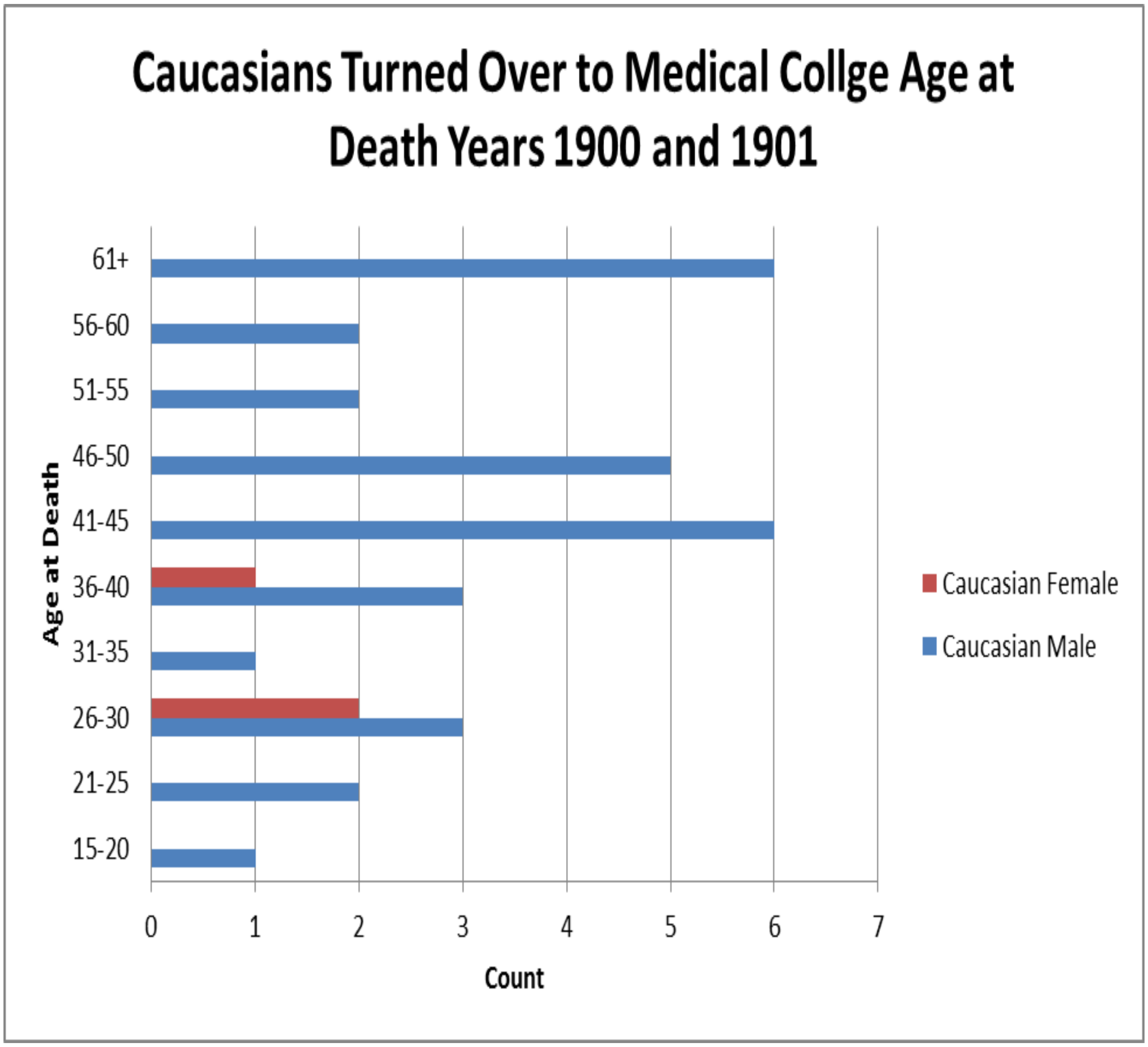


Figure 16 Caucasians Turned Over to Medical College Age at Death Years 1900 and 1901

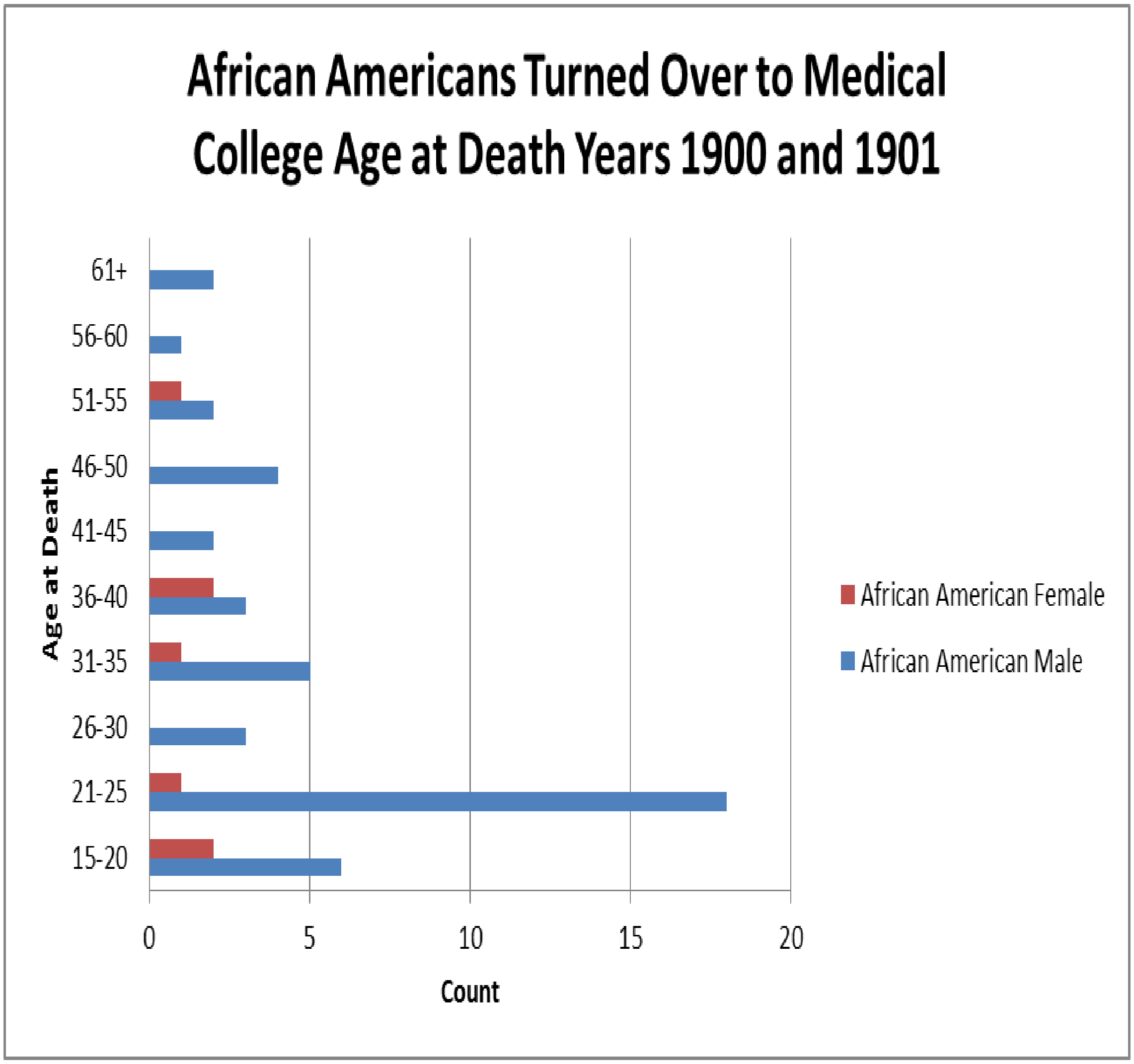


Figure 17 African Americans Turned Over to Medical College Age at Death Years 1900 and 1901

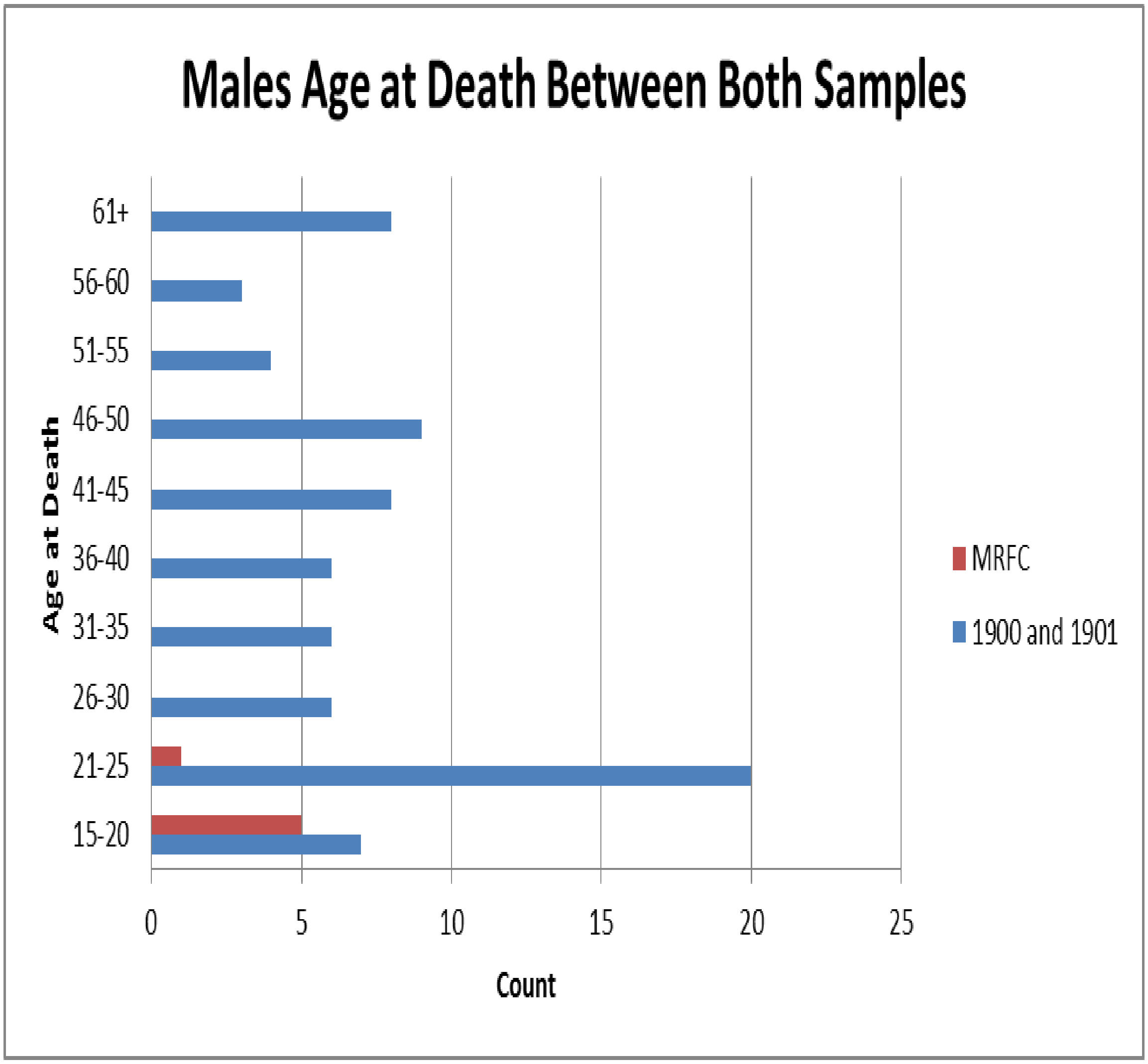


Figure 18   Males Age at Death Between Both Samples

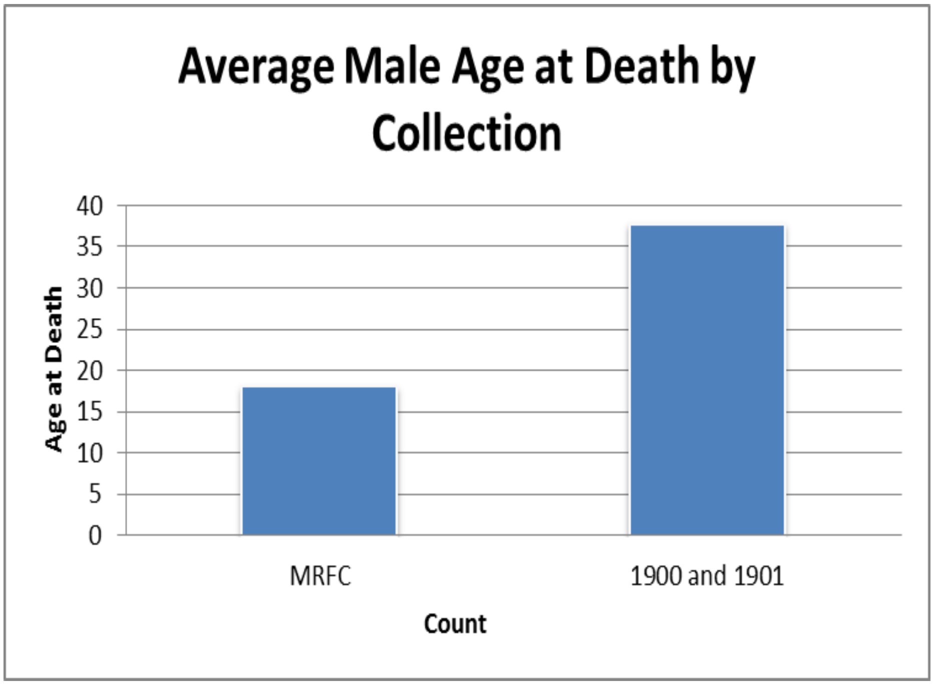


Figure 19 Average Male Age at Death by Collection

From what can be observed in the graphs, it is apparent that, based on this sample, there is a marked difference in age at death between Caucasian males and African American males in (see Figure 12); quite a few more African American men and women were being turned over to medical colleges in 1900 and 1901 than Caucasian men and women (see Tables 12, 13, 15, an 17). For both years, the African American sample appears to be also dying younger and being turned over to the local medical college at a younger age than the Caucasian samples represented (see Tables 12, 13, 15, and 17). Also, there seems to be vastly more men than women represented in this data (Figure 16).

In regard to the MRFC sample, it appears that males were dying earlier than in both of the recorded years (Figure 14). Additionally, the average age at death of the MRFC collection compared to the other samples is also much younger (average male age at death for 1900 and 1901 records is 37.7; the MRFC collection is 18) (Figure 19). Due to the age shown in these results, it is highly unlikely that the MRFC collection is similar to the mortality patterns of those turn-of-the-twentieth century individuals in Memphis who were being turned over to a medical college after death. For this hypothesis, the alternative hypothesis is supported.

Hypothesis B

H_{0b}: The frequency of demonstrably postmortem modification (sawing, drilling, and cutting) seen on the MRFC collection is not significantly greater than contemporary historic collections.

H_{1b}: The frequency of demonstrably postmortem modification (sawing, drilling, and cutting) seen on the MRFC collection is significantly greater than contemporary historic collections.

As stated previously in this thesis, it was decided that the most appropriate comparative collection to test this hypothesis was the Medical College of Georgia Collection (MCG). For each applicable element, a chi-square test was run as well as a Fisher's exact test. The results are as follows:

C Cut Mark Totals of MCG and MRFC Collections

Table 5 Cut Mark Totals of the MCG and MRFC Collections

	MCG Cut Element Data		MRFC Cut Element Data	
Bone Type	**N Total**	**Cut Total**	**N Total**	**Cut Total**
Cranial (excluding teeth)	708	110	8	5
Femur	433	33	34	7
Tibia	349	21	18	3
Fibula	219	4	11	1
Humerus	280	17	23	3
Ulna	289	15	11	1
Radius	236	8	16	1
Long bone fragment	119	16	0	0
Rib	1831	75	0	0
Vertebra	1209	48	91	2
Foot	1506	18	0	0
Sternum	81	10	0	0
Clavicle	156	9	0	0
Pelvis	277	3	23	1
Hand	1383	2	0	0
Unidentified and teeth	732	NA	57	1
Total	9808	389	292	25

Table 6 Cut Mark Statistics of the MCG and MRFC Collections

Pearson's Chi-squared test Cranium		
Collection	N	Cut
MRFC Cranium	8	5
MCG Cranium	708	110
X-squared = 6.7152, df = 1, p-value = 0.00956		
Fisher's Exact Test		
p-value = 0.02385		
Pearson's Chi-square test Femur		
Collection	N	Cut
MRFC Femur	34	7
MCG Femur	433	33

Table 6 (Continued)

X-squared = 5.1769, df = 1, p-value = 0.02289
Fisher's Exact Test
p-value = 0.03313

Pearson's Chi-square test Tibia		
Collection	N	Cut
MRFC Tibia	18	3
MCG Tibia	349	21
X-squared = 2.557, df = 1, p-value = 0.1098		
Fisher's Exact Test		
p-value = 0.13		

Pearson's Chi-square test Fibula		
Collection	N	Cut
MRFC Fibula	11	1
MCG Fibula	219	4
X-squared = 2.3386, df = 1, p-value = 0.1262		
Fisher's Exact Test		
p-value = 0.2323		

Pearson's Chi-square test Humerus		
Collection	N	Cut
MRFC Humerus	23	3
MCG Humerus	280	17
X-squared = 1.3915, df = 1, p-value = 0.2381		
Fisher's Exact Test		
p-value = 0.2105		

Pearson's Chi-square test Ulna		
Collection	N	Cut
MRFC Ulna	11	1
MCG Ulna	289	15
X-squared = 0.27748, df = 1, p-value = 0.5984		
Fisher's Exact Test		
p-value = 0.47		

Table 6 (Continued)

Pearson's Chi-square test Radius		
Collection	N	Cut
MRFC Radius	16	1
MCG Radius	236	8
X-squared = 0.3236, df = 1, p-value = 0.5695		
Fisher's Exact Test		
p-value = 0.4599		

Pearson's Chi-square test Vertebra		
	N	Cut
MRFC Vertebra	91	2
MCG Vertebra	1209	48
X-squared = 0.67557, df = 1, p-value = 0.4111		
Fisher's Exact Test		
p-value = 0.5744		

Pearson's Chi-square test Pelvis		
Collection	N	Cut
MRFC Pelvis	23	1
MCG Pelvis	277	3
X-squared = 1.631, df = 1, p-value = 0.2016		
Fisher's Exact Test		
p-value = 0.2815		

Table 7 Cut Mark Statistics of the MCG and MRFC Collection Total

Pearson's Chi-square test Total		
Collection	N	Cut
MRFC Total Cuts	292	25
MCG Total Cuts	9808	389
X-squared = 13.474, df = 1, p-value = 0.0002419		
Fisher's Exact Test		
p-value = 0.0009923		

Table 8 Cut Mark Comparative Statistics

Cut Mark Comparative Statistics		
Element	**MRFC**	**MCG**
Crania	+	
Femurs	+	
Total	+	

"+" mark indicates a collection has more relative cut marks per element than the other collection between statistically significant elements. An "-" symbol means the collection has less than the other collection.

As can be seen in the tables, only the MRFC and MCG crania, femurs, and the total overall cut frequency test have p-values less than 0.05, which would make them statistically significant. In other words, this indicates that the previously mentioned cut mark frequencies are significantly statistically different. Based on the crania, femurs, and the total overall cut frequency, this would mean that the MRFC collection frequency of skeletal cutting was different than the hypothetically similar, roughly contemporaneous historic sample. However, the tests for independence for the tibia, fibula, humerus, ulna, radius, vertebra, and pelvis cut frequencies indicate statistical insignificance, showing overall similarity between the two collections in regards to these cut frequencies. The differences noted may be a result of sample size or some other factor, including the specific sub-populations from which the two samples were obtained.

Hypothesis C

H_{0c}: Given that the MRFC collection was excavated in downtown Memphis, the skeletal collection will exhibit pathological conditions indicative of contemporary "urban" populations.

H_{1c}: Although the MRFC collection was excavated in downtown Memphis, the skeletal collection will exhibit pathological conditions that are not consistent with contemporary "urban" populations.

To test the third and final hypothesis, two contemporary historic cemetery collections were selected for comparison: the Providence Baptist Church Cemetery, representing a rural population, and the Hunter Army Airfield (9CH875), representing an urban population. The following are the results of statistical testing per element affected by osteoarthritis between the MRFC collection and sample collections.

Table 9 Osteoarthritis Frequency of the MRFC, 9CH875, and Providence Collections

Element	**MRFC**		**9CH875**		**Providence**	
	N	OA	N	OA	N	OA
Cervical Vert.	17	2	650	113	35	18
Thoracic Vert.	47	2	927	12	35	18
Lumbar Vert.	27	3	423	47	36	22
Right OS Coxae	11	2	60	6	35	20
Left Os Coxae	8	1	68	4	36	19
Right Humerus Dis.	4	1	71	1	32	11
Right Humerus Prox.	4	1	70	9	30	12
Left Humerus Dis.	3	1	66	3	34	8
Left Radius Dis.	2	1	50	3	24	6
Right Radius Prox.	3	1	54	5	24	6
Right Radius Dis.	3	3	56	6	20	7
Left Ulna Dis.	1	1	31	1	19	6
Right Ulna Prox.	4	4	83	16	34	16
Left Femur Prox.	6	2	110	18	33	14
Left Femur Dis.	5	2	85	27	36	12
Right Femur Dis.	3	2	88	19	36	12
Left Tibia Dis.	3	1	93	8	35	9
Left Calcaneus	3	1	94	12	30	7
Total	154	31	3079	310	564	223

Table 10 MRFC and Providence Baptist Church Cemetery Osteoarthritis Statistics

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Cervical	17	2
Providence Cervical	35	18
X-squared = 3.8291, df = 1, p-value = 0.05037		
Fisher's Exact Test		
p-value = 0.07287		

Table 10 (Continued)

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Thoracic	47	2
Providence Thoracic	35	18
X-squared = 14.421, df = 1, p-value = 0.0001461		
Fisher's Exact Test		
p-value = 0.0001191		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Lumbar	27	3
Providence Lumbar	36	22
X-squared = 7.5845, df = 1, p-value = 0.005887		
Fisher's Exact Test		
p-value = 0.006127		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Os Coxae Right	11	2
Providence Os Coxae Right	35	20
X-squared = 2.1145, df = 1, p-value = 0.1459		
Fisher's Exact Test		
p-value = 0.1966		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Os Coxae Right	8	1
Providence Os Coxae Left	36	19
X-squared = 1.977, df = 1, p-value = 0.1597		
Fisher's Exact Test		
p-value = 0.2524		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Distal Right	4	1
Providence Humerus Distal Right	32	11
X-squared = 0.074419, df = 1, p-value = 0.785		

Table 10 (Continued)

Fisher's Exact Test
p-value = 1

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Proximal Right	4	1
Providence Humerus Proximal Right	30	12
X-squared = 0.16406, df = 1, p-value = 0.6854		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Proximal Left	2	0
Providence Humerus Proximal Left	33	12
X-squared = 0.71619, df = 1, p-value = 0.3974		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Distal Left	3	1
Providence Humerus Distal Left	34	8
X-squared = 0.082225, df = 1, p-value = 0.7743		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Proximal Left	1	0
Providence Radius Proximal Left	24	4
X-squared = 0.16571, df = 1, p-value = 0.6839		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#

Table 10 (Continued)

MRFC Radius Distal Left	2	1
Providence Radius Distal Left	24	6
X-squared = 0.29011, df = 1, p-value = 0.5902		
Fisher's Exact Test		
p-value = 0.5235		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Proximal Right	3	1
Providence Radius Proximal Right	24	6
X-squared = 0.053968, df = 1, p-value = 0.8163		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Distal Right	3	3
Providence Radius Distal Right	20	7
X-squared = 1.3471, df = 1, p-value = 0.2458		
Fisher's Exact Test		
p-value = 0.3364		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Proximal Right	4	4
Providence Ulna Proximal Right	34	16
X-squared = 0.98905, df = 1, p-value = 0.32		
Fisher's Exact Test		
p-value = 0.4278		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Distal Right	1	0
Providence Ulna Distal Right	18	5
Fisher's Exact Test		

Table 10 (Continued)

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Proximal Left	0	0
Providence Ulna Proximal Left	35	12
Fisher's Exact Test		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Distal Left	1	1
Providence Ulna Distal Left	19	6
X-squared = 0.65186, df = 1, p-value = 0.4194		
Fisher's Exact Test		
p-value = 0.4587		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Proximal Right	3	0
Providence Femur Proximal Right	33	11
Fisher's Exact Test		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Distal Right	3	2
Providence Femur Distal Right	36	12
X-squared = 0.52418, df = 1, p-value = 0.4691		
Fisher's Exact Test		
p-value = 0.5987		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Proximal Left	6	2
Providence Femur Proximal Left	33	14
X-squared = 0.075951, df = 1, p-value = 0.7829		

Table 10 (Continued)

Fisher's Exact Test
p-value = 1

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Distal Left	5	2
Providence Femur Distal Left	36	12
X-squared = 0.041065, df = 1, p-value = 0.8394		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Tibia Distal Left	3	1
Providence Tibia Distal Left	35	9
X-squared = 0.045933, df = 1, p-value = 0.8303		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Calcaneus Left	3	1
Providence Calcaneus Left	30	7
X-squared = 0.084997, df = 1, p-value = 0.7706		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Total	154	31
Providence Total	564	223
X-squared = 10.403, df = 1, p-value = 0.001258		
Fisher's Exact Test		
p-value = 0.001093		

Table 11 MRFC and 9CH875 Osteoarthritis Statistics

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Cervical	17	2
9CH875 Cervical	650	113
X-squared = 0.2712, df = 1, p-value = 0.6025		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Thoracic	47	2
9CH875 Thoracic	927	12
X-squared = 2.6205, df = 1, p-value = 0.1055		
Fisher's Exact Test		
p-value = 0.1501		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Lumbar	27	3
9CH875 Lumbar	423	47
X-squared = 0, df = 1, p-value = 1		
Fisher's Exact Test		
p-value = 1		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Os Coxae Right	11	2
9CH875 Os Coxae Right	60	6
X-squared = 0.47269, df = 1, p-value = 0.4918		
Fisher's Exact Test		
p-value = 0.6119		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Os Coxae Right	8	1
9CH875	68	4
X-squared = 0.42632, df = 1, p-value = 0.5138		
Fisher's Exact Test		
p-value = 0.4539		

Table 11 (Continued)

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Right Distal	4	1
9CH875 Humerus Right Distal	71	1
X-squared = 6.401, df = 1, p-value = 0.01141		
Fisher's Exact Test		
p-value = 0.1265		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Right Proximal	4	1
9CH875 Humerus Right Proximal	70	9
X-squared = 0.33221, df = 1, p-value = 0.5644		
Fisher's Exact Test		
p-value = 0.4782		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Left Proximal	2	0
9CH875 Humerus Left Proximal	33	12
Fisher's Exact Test		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Humerus Left Distal	3	1
9CH875 Humerus Left Distal	66	3
X-squared = 3.1135, df = 1, p-value = 0.07764		
Fisher's Exact Test		
p-value = 0.2057		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Left Proximal	1	0
9CH875 Radius Left Proximal	59	5

Table 11 (Continued)

Fisher's Exact Test

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Left Distal	2	1
9CH875 Radius Left Distal	50	3
X-squared = 3.2782, df = 1, p-value = 0.07021		
Fisher's Exact Test		
p-value = 0.2027		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Right Proximal	3	1
9CH875 Radius Right Proximal	54	5
X-squared = 1.1872, df = 1, p-value = 0.2759		
Fisher's Exact Test		
p-value = 0.3369		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Radius Right Distal	3	3
9CH875 Radius Right Distal	56	6
X-squared = 7.7456, df = 1, p-value = 0.005384		
Fisher's Exact Test		
p-value = 0.02699		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Right Proximal	4	4
9CH875 Ulna Right Proximal	83	16
X-squared = 5.5767, df = 1, p-value = 0.0182		
Fisher's Exact Test		
p-value = 0.03859		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Right Distal	1	0
9CH875 Ulna Right Distal	40	4

Table 11 (Continued)

Fisher's Exact Test

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Left Proximal	0	0
9CH875 Ulna Left Proximal	80	15
Fisher's Exact Test		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Ulna Left Distal	1	1
9CH875 Ulna Left Distal	31	1
X-squared = 7.4707, df = 1, p-value = 0.006271		
Fisher's Exact Test		
p-value = 0.1159		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Right Proximal	3	0
9CH875 Femur Right Proximal	105	18
Fisher's Exact Test		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur Right Distal	3	2
9CH875 Femur Right Distal	88	19
X-squared = 1.5513, df = 1, p-value = 0.2129		
Fisher's Exact Test		
p-value = 0.235		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur left Proximal	6	2
9CH875 Femur left Proximal	110	18

Table 11 (Continued)

X-squared = 0.7181, df = 1, p-value = 0.3968
Fisher's Exact Test
p-value = 0.3338

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Femur left Distal	5	2
9CH875 Femur left Distal	85	27
X-squared = 0.07124, df = 1, p-value = 0.7895		
Fisher's Exact Test		
p-value = 0.6777		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Tibia Left Distal	3	1
9CH 875 Tibia Left Distal	98	8
X-squared = 1.5629, df = 1, p-value = 0.2112		
Fisher's Exact Test		
p-value = 0.2928		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Calcaneus Left	3	1
9CH875 Calcaneus Left	94	12
X-squared = 0.6921, df = 1, p-value = 0.4055		
Fisher's Exact Test		
p-value = 0.3998		

Pearson's Chi-squared test		
Collection	N	OA#
MRFC Total	154	31
9CH875 Total	3079	310
X-squared = 11.769, df = 1, p-value = 0.0006021		
Fisher's Exact Test		
p-value = 0.001772		

For the rural chi-square and Fisher's exact test results (MRFC and Providence), one can see that three out of the 19 element types and element sections (thoracic, lumbar, and the total test) have p-values lower than 0.05. This would indicate that the previously mentioned occurrences of osteoarthritis between both collections are statistically significant. The other 16 osteoarthritis frequencies shown above would therefore be statistically insignificant. Based on these results, the majority of the MRFC osteoarthritis frequencies are statistically similar to the rural Providence Baptist Church cemetery frequencies.

In regard to the urban chi-square and Fisher's exact test results (MRFC and 9CH875), only three of the 19 element sections (right radius distal, right ulna proximal, and total test) have p-values lower than 0.05. Contrarily, the other 16 osteoarthritis tests have a p-value higher than 0.05 and would therefore differences are statistically insignificant. Of course this would mean that, between the two collections, a relatively small portion of corresponding osteoarthritis afflicted elements are statistically dissimilar.

Table 12 Osteoarthritis Statistical Results by Element

MRFC and Providence		MRFC and 9CH875	
Greater than 0.05	**Less than 0.05**	**Greater than 0.05**	**Less than 0.05**
Os Coxae Right	Cervical (only chi square)	Cervical	Radius Right distal
Os Coxae Left	Thoracic	Thoracic	Ulna Right Proximal
Humerus Right Distal	Lumbar	Lumbar	Total
Humerus Right Proximal	Total	Os Coxae Right	Humerus Right Distal (only chi square)
Humerus Left Distal		Os Coxae Left	Ulna Left Distal (only chi square)
Radius Left Distal		Humerus Right Distal	
Radius Right Proximal		Humerus Right Proximal	
Radius Right distal		Humerus Left Distal	
Ulta Right Proximal		Radius Left Distal	
Ulna Left Distal		Radius Right Proximal	
Femur Right Distal		Ulna Left Distal	
Femur Left Proximal		Femur Right Distal	
Femur Left Distal		Femur Left Proximal	
Tibia Left Distal		Femur Left Distal	
Calcaneus Left		Tibia Left Distal	
		Calcaneus Left	

Table 13 OA Comparative Statistics

OA Comparative Statistics			
Element		**9CH875**	**Providence**
Right Radius Distal		-	
Right Ulna Proximal		-	
Cervical			+ (nearly significant)
Thoracic			+
Lumbar			+
Total		-	+

"+" mark indicates a collection has more relative OA per statistically significant element than the MRFC collection. An "-" symbol means the collection has less than the MRFC.

CHAPTER VI

DISCUSSION, CONCLUSIONS, AND FUTURE RESEARCH

When interpreting the results of this thesis, one cannot ignore the contemporary historic documentation. The historical records reviewed for Hypothesis A describe a sample of a population that had been given over to one or more local medical institutions for dissection and postmortem experimentation. In 1900 and 1901, many more African American men and women were being turned over to medical colleges for dissection than Caucasian men and women, an apparent example of “structural violence” (Sappol, 2002). Furthermore, according to this sample, African American men and women in 1900 and 1901 Shelby County were dying at a much younger age than their Caucasian counterparts. This difference in mortality between these two races could very well be a result of “structural violence” as expressed in different lifestyles, workloads, housing conditions, etc. Again, to adequately investigate this possibility, one would likely have to complete an exhaustive study on a wide array of social and biological factors (e.g., rates of metabolic stress, comparison of causes of death, study of various contemporary laws, etc.) at play in that place and time.

The relative ages at death in the records were on the whole much older than the MRFC remains. This disparity in ages may very likely simply reflect sample size bias for the MRFC remains. It also is possible that the individuals represented in the MRFC collection were chosen for teaching/experimentation work precisely because they were young, and/or had died of causes unlike those listed in the historical records. Further historical research on the use of cadavers by turn-of-the-twentieth century institutions might shed further light on this topic. In particular, more research on the many medical colleges that were established in Memphis from the mid-19th through early 20th centuries (e.g., https://www.uthsc.edu/surgery/pdf_files/memphis-medical-history.pdf) would be informative.

Through the testing of Hypothesis B, I have determined that the MRFC collection is statistically similar, in general terms, to the MCG collection in regards to cut mark occurrence. Based on the assumption that the MCG collection is representative of historic anatomical collections, this conclusion would mean that the MRFC collection is likely similar to contemporary historic anatomical collections, i.e., samples exploited for late 19th-early 20th century medical college research. Additionally, it is also possible that the cut mark prevalence of these two collections is statistically similar because the MRFC collection was affected by "structural violence," as the MCG collection likely was (see Harrington and Blakely, 1995a; 1995b).

With regard to Hypothesis C, results of the "urban vs. rural" comparison were less than transparent. The MRFC collection appears to be statistically similar to both a comparable urban collection and a rural collection, depending on which data one chooses to observe. While it is likely that these results may be the product of the small MRFC sample set, I believe another reason could also be possible. To elaborate, the MRFC collection could represent a transient sample of the Memphis population that shows osteoarthritic signs of both urban and rural populations. Based on historic records, we know that Memphis experienced a population boom between 1890 and 1920, our approximate date for the site (Capers, 1939:203). From the osteological data, we know that the collection likely consists of males in their late teenage years and possibly their early twenties. Considering the economic success Memphis was experiencing at the time, these men could easily have been either transient workers or possibly military soldiers traveling through the city when they died. A varying array of both urban and rural activities (e.g., rural laborers stressing their hip joints disproportionally to urban laborers) (see Jordan et al., 1995; Davidson et al., 2002) could explain the similar osteoarthritis occurrences of the MRFC to both the urban and rural collections.

However, we can see from the Fisher's Exact tests between the MRFC and the Providence collections that only elements in the spinal column (thoracic and lumbar vertebra) were tested to be significantly different for the rural site comparison. For the urban comparison, the MRFC and 9CH875 collections had only elements in the arm (right radius distal and right ulna proximal) that were tested to be significantly different. The prevalence of OA of these two different joint systems between the MRFC collection and rural and urban collections could indicate specific behavior patterns.

To continue, the Providence collection has a statistically significant and higher prevalence of OA in the spinal column than the MRFC collection (see Table 13). This could mean that the rural Providence sample could be comprised of individuals that were subjected to a higher frequency or more impactful rural activities (e.g. agricultural activities associated with strenuous work concentrated on the human back) compared to the MRFC sample. Based on this vertebral OA data, it seems possible that the MRFC sample individuals likely performed OA causing activities that differed to the Providence rural sample.

In regards to the urban OA comparison, the 9CH875 collection has a statistically significant and lower OA prevalence of the right radius distal and right ulna proximal elements than the MRFC collection (see Table 13). Given this OA data, it seems possible that the MRFC sample individuals performed labor specific to arm usage (e.g. heavy upper body lifting) at a higher frequency and/or intensity than our urban sample. This could mean that the MRFC sample individuals were also performing arduous labor not necessarily common to individuals from a contemporary urban population.

Furthermore, the MRFC collection represents a very small sample of some late 19^{th}/ early 20^{th} century population or sub-group. Even though the sample is small, it still provides at least a minor glimpse into the lives and deaths of a few individuals of the past. Based on the research presented here, it seems likely that the MRFC collection consists of anatomical remains from individuals subjected to a form of contemporary "structural violence". Whether seen through evidence of skeletal dissection or historic records, the MRFC collection appears to be a group of people who were used by the medical community of the time and subsequently discarded. Even though this research was small in scope and limited in analysis, I believe that this thesis does meaningfully contribute to the growing body of literature on "structural violence", analysis of commingled remains, and historic bioarchaeological research.

During the course of testing the hypotheses in this thesis, I came to realize that there are a number of opportunities for future research for the MRFC collection. I believe that asking questions on a more individual scale would have been more appropriate than the population-based or large-sample-based comparisons I made in this research. Due to the sample size of the collection, conducting this thesis within the framework of an "osteobiography" (e.g., Saul and Saul, 1989) could have provided meaningful data on an individual scale.

To elaborate**,** Stodder and Palkovich describe an osteobiography as, "a uniquely valuable component to the study of prehistory that considers individuals, their intentions, and their socially contextualized identities as fundamental to understanding the past" (2012:3). Osteobiographies, such as: Neitzel's study of a Hopi leader (2012), Walker et al.'s work in Iceland (2012), and Thompson's analysis of a Neolithic individual in Egypt (2012), intend to create a reconstruction of an individual's life using associated artifacts, skeletal pathology, taphonomic indicators, environmental data, and general osteological data (e.g. age, sex, height, etc.). While this reconstructive approach is usually used on complete (or somewhat complete) discrete skeletons or non-commingled remains (see Saul and Saul, 1989; Palkovich, 2012; Merbs, 2012; Storey and Widner, 2012), I believe that applying this kind of individual analysis to certain MRFC elements (e.g. crania) as substitute for complete individuals could work in better understanding the lives of the people represented in this collection.

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APPENDIX A

ADDITIONAL DATA

Table 14 Inventory Master

ID	Bone	Side	ID	Bone	Side
1	Femur	L	**206**	Lumbar 1	
2	Femur	L	**207**	Lumbar 4	
3	Femur	R	**208**	Lumbar 5	
4	Femur	L	**209**	Thoracic 2-9	
5	Femur	L	**210**	Thoracic 2-9	
6	Femur	L	**211**	Thoracic 1	
7	Femur	L	**212**	Thoracic 2-9	
8	Femur	L	**213**	Thoracic 2-9	
9	Femur	R	**214**	Thoracic 2-9	
10	Femur	L	**215**	Thoracic 2-9	
11	Femur	L	**216**	Thoracic 2-9	
12	Femur	L	**217**	Thoracic 2-9	
13	Femur	R	**218**	Thoracic 2-9	
14	Femur	R	**219**	Thoracic 2-9	
15	Femur	R	**220**	Thoracic 2-9	
16	Femur	R	**221**	Thoracic 2-9	
17	Femur	L	**222**	Thoracic 2-9	
18	Femur	L	**223**	Thoracic 2-9	
19	Femur	R	**224**	Thoracic 2-9	
20	Femur	R	**225**	Thoracic 2-9	

Table 14 (Continued)

21	Femur	L	**226**	Cervical 3-6	
22	Femur	L	**227**	Cervical 3-6	
23	Femur	R	**228**	Talus	R
24	Femur	L	**229**	Talus	L
25	Femur	L	**230**	Talus	L
26	Patella	L	**231**	Talus	L
27	Patella	R	**232**	Calcaneus	R
28	Femur	R	**233**	Calcaneus	L
29	Femur	L	**234**	Calcaneus	L
30	Femur	L	**235**	Patella	R
31	Femur	L	**236**	Navicular	L
32	Tibia	L	**237**	Navicular	L
33	Fibula	L	**238**	Navicular	L
34	Fibula	?	**239**	Navicular	L
35	Fibula	L	**240**	Cuneiform (First)	L
36	Fibula	L	**241**	Hamate	R
37	Fibula	?	**242**	Trapezium	R
38	Fibula	?	**243**	Metatarsal 1	L
39	Fibula	?	**244**	Metatarsal 1	L
40	Humerus	R	**245**	Metatarsal 1	R
41	Humerus	L	**246**	Metatarsal 2	L

Table 14 (Continued)

42	Radius	R	**247**	Metatarsal 5	R
43	Radius	R	**248**	Metatarsal 2	L
44	Ulna	R	**249**	Metacarpal 3	L
45	Radius	R	**250**	Metatarsal 2	L
46	Humerus	R	**251**	Metatarsal 4	L
47	Tibia	L	**252**	Metatarsal 4	L
48	Humerus	R	**253**	Metacarpal 4	R
49	Humerus	R	**254**	Talus	L
50	Tibia	R	**255**	Patella	L
51	Humerus	L	**256**	Scapula	R
52	Humerus	R	**257**	Scapula	R
53	Tibia	L	**258**	Scapula	R
54	Radius	R	**259**	Scapula	R
55	Radius	R	**260**	Scapula	R
56	Humerus	L	**261**	Scapula	R
57	Radius	L	**262**	Scapula	R
58	Radius	L	**263**	Rib 1	?
59	Humerus	L	**264**	Rib 1	R
60	Ulna	R	**265**	Rib 1	L
61	Ulna	R	**266**	Rib 1	L
62	Ulna	R	**267**	Rib 1	L
63	Humerus	L	**268**	Rib 1	R
64	Humerus	L	**269**	Rib 1	R
65	Humerus	R	**270**	Rib 2	L
66	Humerus	R	**271**	Rib 10	R
67	Humerus	R	**272**	Rib 11	L
68	Tibia	R	**273**	Rib 12	L
69	Tibia	L	**274**	Rib 11	R

Table 14 (Continued)

70	Tibia	R	**275**	Rib 3-10	L
71	Tibia	R	**276**	Rib 3-10	R
72	Tibia	R	**277**	Rib 11	L
73	Tibia	R	**278**	Rib 3-10	R
74	Humerus	L	**279**	Rib 3-10	R
75	Radius	L	**280**	Rib 2	R
76	Ulna	L	**281**	Rib 2	L
77	Clavicle	R	**282**	Rib 12	L
78	Clavicle	R	**283**	Rib 11	L
79	Clavicle	R	**284**	Rib 3-10	L
80	Humerus	R	**285**	Rib 2	R
81	Humerus	R	**286**	Rib 1	?
82	Femur	L	**287**	Rib 3-9	L
83	Radius	L	**288**	Rib 3-9	R
84	Radius	L	**289**	Hamate	L
85	Radius	L	**290**	Mandible	
86	Radius	L	**291**	Tibia	?
87	Radius	L	**292**	Phalange 1	L
88	Radius	R	**293**	Metacarpal 3	L
89	Ulna	L	**294**	Metacarpal 2	L
90	Ulna	L	**295**	Phalange 1	?
91	Ulna	R	**296**	Metacarpal 5	R
92	Ulna	R	**297**	Metacarpal 3	L
93	Humerus	L	**298**	Metacarpal 2	R
94	Humerus	R	**299**	Metacarpal 2	L
95	Humerus	L	**300**	Metacarpal 2	R

Table 14 (Continued)

96	Humerus	R	**301**	Metacarpal 2	R
97	Humerus	R	**302**	Metacarpal 4	L
98	Tibia	L	**303**	Metatarsal 2	L
99	Tibia	R	**304**	Metatarsal 3	L
100	Tibia	R	**305**	Metatarsal 4	L
101	Tibia	L	**306**	Sacrum	
102	Humerus	?	**307**	Ulna	?
103	Fibula	L	**308**	Femur	?
104	Fibula	L	**309**	Cranium	L
105	Fibula	L	**310**	Vertebra ?	?
106	Fibula	?	**311**	Tibia	?
107	Radius	L	**312**	Scapula	?
108	Os Coxae	R	**313**	Metatarsal 4	L
109	Os Coxae	R	**314**	Metatarsal ?	?
110	Os Coxae	L	**315**	Hand Phalange	?
111	Os Coxae	L	**316**	Metacarpal 4	L
112	Os Coxae	R	**317**	Metatarsal ?	?
113	Os Coxae	L	**318**	Metatarsal ?	?
114	Os Coxae	L	**319**	Hand Phalange	?
115	Sacrum		**320**	Hand Phalange	?
116	Sacrum		**321**	Hand Phalange	?

Table 14 (Continued)

117	Sacrum		**322**	Phalange ?	?
118	Os Coxae	L	**323**	Phalange ?	?
119	Os Coxae	R	**324**	Vertebrae	
120	Os Coxae	R	**325**	Misc.Frags	
121	Os Coxae	L	**326**	Rib	
122	Os Coxae	R	**327**	Scapula	?
123	Sacrum		**328**	Mandible	
124	Sacrum		**329**	Mandible	
125	Sacrum		**330**	Mandible	
126	Os Coxae	R	**331**	Frontal	
127	Coccyx		**332**	Frontal	
128	Os Coxae	L	**333**	Temporal	
129	Os Coxae	R	**334**	Cranium	
130	Os Coxae	R	**335**	Canine Upper	L
131	Os Coxae	R	**336**	Incisor Lower	L
132	Os Coxae	?	**337**	Incisors Upper	R
133	Radius	L	**338**	Canine Lower	L
134	Tibia	L	**339**	Premolar Upper	L
135	Femur	R	**340**	Molar Upper	R
136	Tibia	R	**341**	Molar lower	R

Table 14 (Continued)

137	Os Coxae	R	**342**	Molar lower	R
138	Cervical 2		**343**	Cranium	
139	Cervical 2		**344**	Cranium	
140	Cervical 7		**345**	Cranium	
141	Cervical 3-6		**346**	Scapula	
142	Cervical 3-6		**347**	Humerus	
143	Cervical 3-6		**348**	Tibia	R
144	Cervical 7		**349**	Metatarsal	L
145	Cervical 7		**350**	Humerus	
146	Cervical 7		**351**	Femur	?
147	Cervical 3-6		**352**	Cuneiform	R
148	Lumbar 5		**353**	Cuboid	?
149	Cervical 2		**354**	Sternum	
150	Cervical 3-6		**355**	Os Coxae	?
151	Thoracic 2-9		**356**	Os Coxae	?
152	Cervical 3-6		**357**	Os Coxae	L
153	Cervical 7		**358**	Scapula	?
154	Cervical 1		**359**	Scapula	R

Table 14 (Continued)

155	Lumbar 5		**360**	Mandible	
156	Lumbar 2		**361**	Thoracic Vert	
157	Lumbar 4		**362**	Calcaneus	L
158	Lumbar 1		**363**	Thoracic ?	
159	Lumbar 1		**364**	Ulna	L
160	Lumbar 4		**365**	Rid 2-9	?
161	Lumbar 2		**366**	Phalange Foot	?
162	Lumbar 4		**367**	Canine Upper	R
163	Lumbar 2		**368**	Canine Upper	R
164	Lumbar 1		**369**	Canine Upper	L
165	Lumbar 4		**370**	Canine Lower	L
166	Lumbar 2		**371**	371	R
167	Lumbar 3		**372**	Canine Lower	L
168	Lumbar 3		**373**	Incisor Lower	L
169	Lumbar 1		**374**	Incisor Lower	R
170	Lumbar 1		**375**	Incisor Lower	L
171	Lumbar 1		**376**	Incisor Upper	L
172	Lumbar 3		**377**	Premolar Upper	L

Table 14 (Continued)

173	Lumbar 4		**378**	Premolar Upper	R
174	Lumbar 2		**379**	Premolar Upper	L
175	Lumbar 5		**380**	Premolar Lower	?
176	Thoracic 12		**381**	Premolar Lower	?
177	Sacrum		**382**	Premolar	?
178	Thoracic 12		**383**	Premolar ?	?
179	Thoracic 12		**384**	Canine Lower	R
180	Thoracic 10		**385**	Canine Upper	R
181	Thoracic 2-9		**386**	Molar Lower	
182	Thoracic 1		**387**	Molar Lower	L
183	Thoracic 2-9		**388**	Molar Upper	R
184	Thoracic 2-9		**389**	Molar Upper	R
185	Thoracic 10-11		**390**	Molar Lower	L
186	Thoracic 2-9		**391**	Molar Lower	R
187	Thoracic 2-9		**392**	Canine Lower	L
188	Thoracic 11		**393**	Incisor ?	?
189	Thoracic 2-9		**394**	metacarpal	?
190	Thoracic 2-9		**395**	metacarpal	?

Table 14 (Continued)

191	Thoracic 2-9		**396**	Metacarpal	?
192	Thoracic 1		**397**	Lunate	L
193	Thoracic 2-9		**398**	Scapula	R
194	Thoracic 10-11		**399**	Scapula	?
195	Thoracic 10-11		**400**	Rib	
196	Thoracic 2-9		**401**	Vertebra Frags	
197	Thoracic 2-9		**402**	Hyoid greater horn	
198	Thoracic 2-9		**403**	Hyoid Greater Horn	
199	Thoracic 2-9		**404**	Trapezium	?
200	Thoracic 2-9		**405**	Femur	R
201	Thoracic 10		**406**	Os Coxae	?
202	Thoracic 2-9		**407**	Unknown Frag	?
203	Thoracic 10-12		**408**	Trapezium ?	?
204	Lumbar 5		**409**	Scaphoid?	?
205	Lumbar 2				

Table 15 Mandible Age (Dental Eruption)

ID	3rd Molar Present
328	No
329	Yes
330	No

Table 16 Os Coxae Sciatic Notch Inventory

ID	Side	Score	Sex
108	R	5	M
109	R	4	M
111	L	4	M
112	R	5	M
114	L	4	M

Table 17 Craniometrics (millimeters)

Measurement		Cranium 343	Cranium 344	Cranium 345
GOL	Glabello-occipital length	183	172	189
NOL	Nasio-occipital length	180	170	185
BNL	Basion-nasion length	103	100	102
BBH	Basion-bregma height	143	135	139
XCB	Maximum cranial breadth	142	136	151
XFB	Maximum frontal breadth	119	110	115
WFB	Minimum frontal breadth	100	99	96
ZYB	Bizygomatic breadth	124	126	130
AUB	Biauricular breadth	121	120	125
ASB	Biasterionic breadth	108	113	110
BPL	Basion-prosthion length	87	92	93
NPH	Nasion-prosthion height	71	66	71
NLH	Nasal height	54	51	50
JUB	Bijugal breadth	106	116	113
NLB	Nasal breadth	19	25	21
MAB	External palate breadth	58	61	62
MAL	External palate length	49	50	48
MDH	Mastoid height	31	31	28
OBH	Orbit height	33	36	34
OBB	Orbit breadth	39	43	40

Table 17 (Continued)

DKB	Interorbital breadth	23	28	21
NDS	Naso-dacryal subtense	13	14	
WNB	Simotic chord	8.2	10.7	
SIS	Simotic subtense	6.4	9	
ZMB	Bimaxillary breadth	88	101	95
SSS	Zygomaxillary subtense	28	25	23
FMB	Bifrontal breadth	97	106	100
NAS	Nasio-frontal subtense	22	20	20
EKB	Biorbital breadth	95	105	99
DKS	Dacryon subtense	14	17	13
IML	Malar length inferior	37	39	29
XML	Malar length maximum	56	51	53
MLS	Malar subtense MLS	13	17	12
WMH	Cheek height, minimum	27	21	28
GLS	Glabella projection	3	2	5
STB	Bistephanic breadth	125	112	122
FRC	Frontal chord	118	103	120
FRS	Frontal subtense	32	105	27
FRF	Frontal fraction	47	96	50
PAC	Parietal chord	115	117	117
PAS	Parietal subtense	23	28	25
PAF	Parietal fraction	62	74	71
OCC	Occipital chord	95	91	97
OCS	Occipital subtense	29	205	31
OCF	Occipital fraction	53	192	59
FOL	Foramen magnum length	37	36	38
FOB	Foramen magnum breadth	31	27	30
NAR	Nasion radius	96	93	99
SSR	Subspinale radius	93	95	93
PRR	Prosthion radius	95	99	96
DKR	Dacryon radius	83	84	87
ZOR	Zygoorbitale radius	78	80	83
FMR	Frontomalare radius	74	72	80
EKR	Ectoconchion radius	70	68	75
ZMR	Zygomaxillare radius	67	74	71
AVR	Molar 1 Alveolus radius	72	73	78
BRR	Bregma radius	124	116	131

Table 17 (Continued)

VRR	Vertex radius	124	117	132
LAR	Lambda radius	102	100	112
OSR	Opisthion radius	41	39	39
BAR	Basion radius	20	19	9

Table 18 Craniometrics FORDISC Abbreviation Key

Forensic Database Groups		**Table of Howells groups**		
Name	**Abbreviation**	**Name**	**Abbreviation**	**Area**
White Male	WM	AINU	AIN	Hokkaido, Japan
White Female	WF	ANDAMAN ISLAND	AND	Andaman Islands
Asian Male	AM	ANYANG	ANY	China
Asian Female	AF	ARIKARA	ARI	South Dakota, USA
Black Male	BM	ATAYAL	ATA	Taiwan
Black Female	BF	AUSTRALIA	AUS	Lower Murray River
Hispanic Male	HM	BERG	BER	Austria
Hispanic Female	HF	BURIAT	BUR	Siberia, Russia
Guatemalan Male	GTM	BUSHMAN	BUS	South Africa
		DOGON	DOG	Mali

Table 18 (Continued)

		EASTER ISLAND	EAS	Easter Island
		EGYPT	EGY	Gizah
		ESKIMO	ESK	Greenland
		GUAM	GUA	Guam
		HAINAN	HAI	China
		MOKAPU	MOK	Hawaii
		MORIORI	MOR	Chatham Islands
		NORSE	NOR	Oslo, Norway
		NORTH JAPAN	NJA	Hokkaido, Japan
		PERU	PER	Peru
		PHILLIPINES	PHI	Philippines
		SANTA CRUZ	SAN	California, USA
		SOUTH JAPAN	SJA	Kyushu, Japan
		TASMANIA	TAS	Tasmania
		TEITA	TEI	Kenya
		TOLAI	TOL	New Britain
		ZALAVAR	ZAL	Hungary
		ZULU	ZUL	South Africa

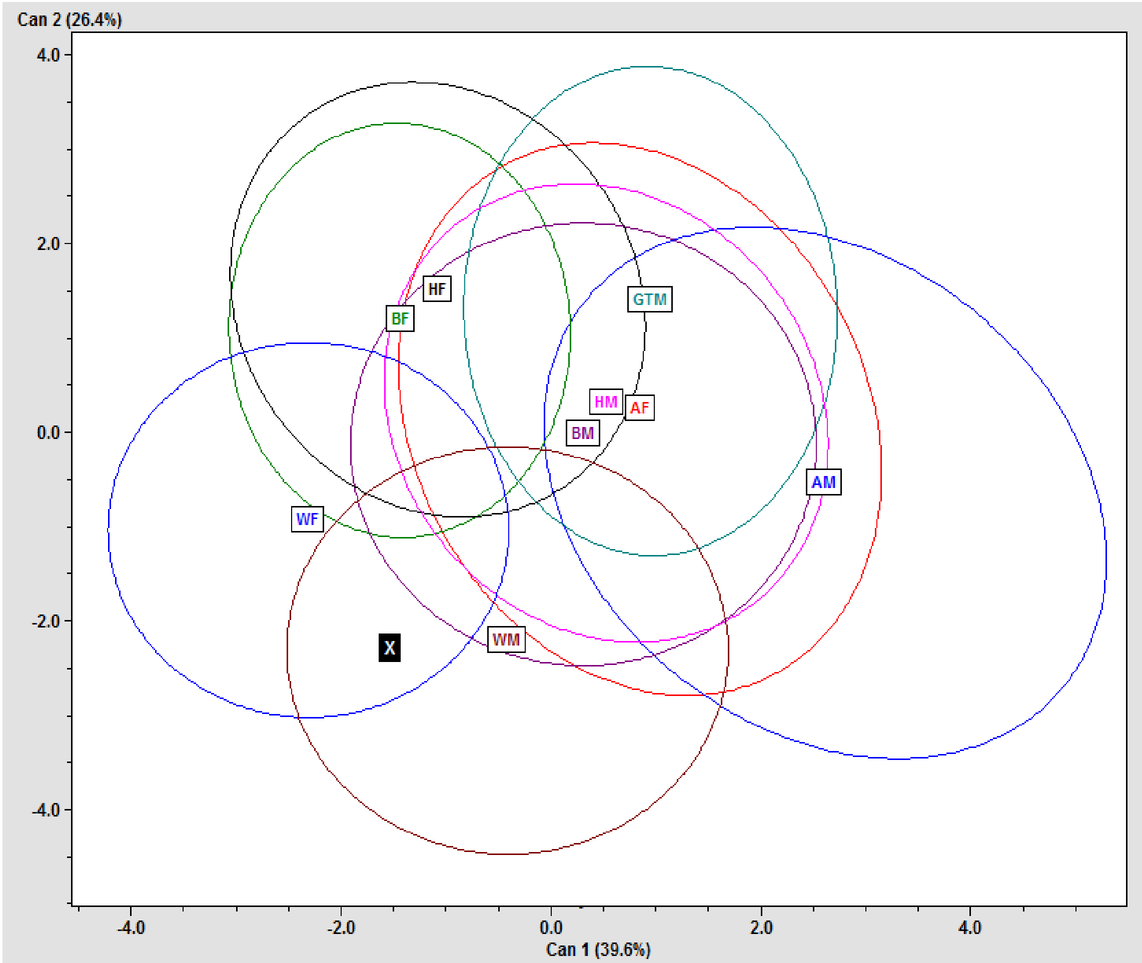

Figure 20 FORDISC MRFC 343 Craniometrics

Howells just Males

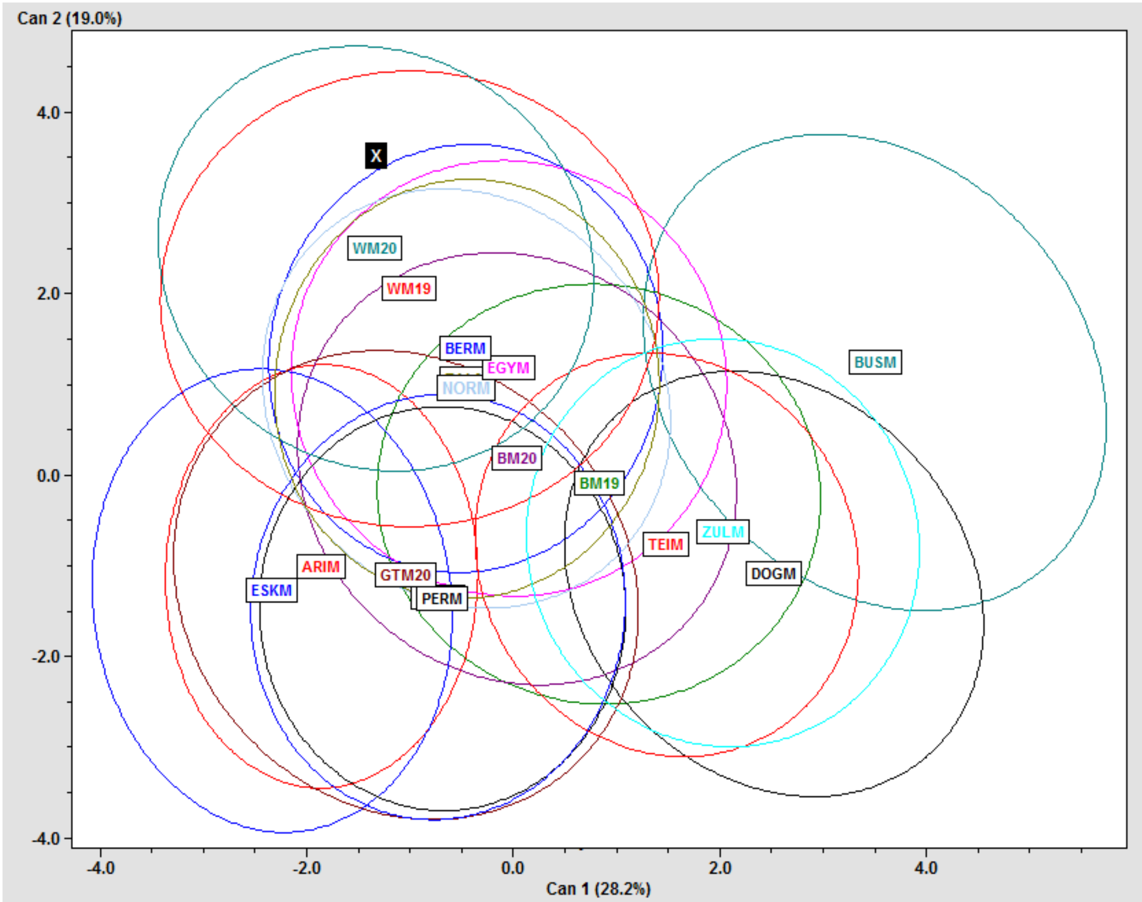

Figure 21 FORDISC MRFC 344 Craniometrics

Forensic Database (FDB)

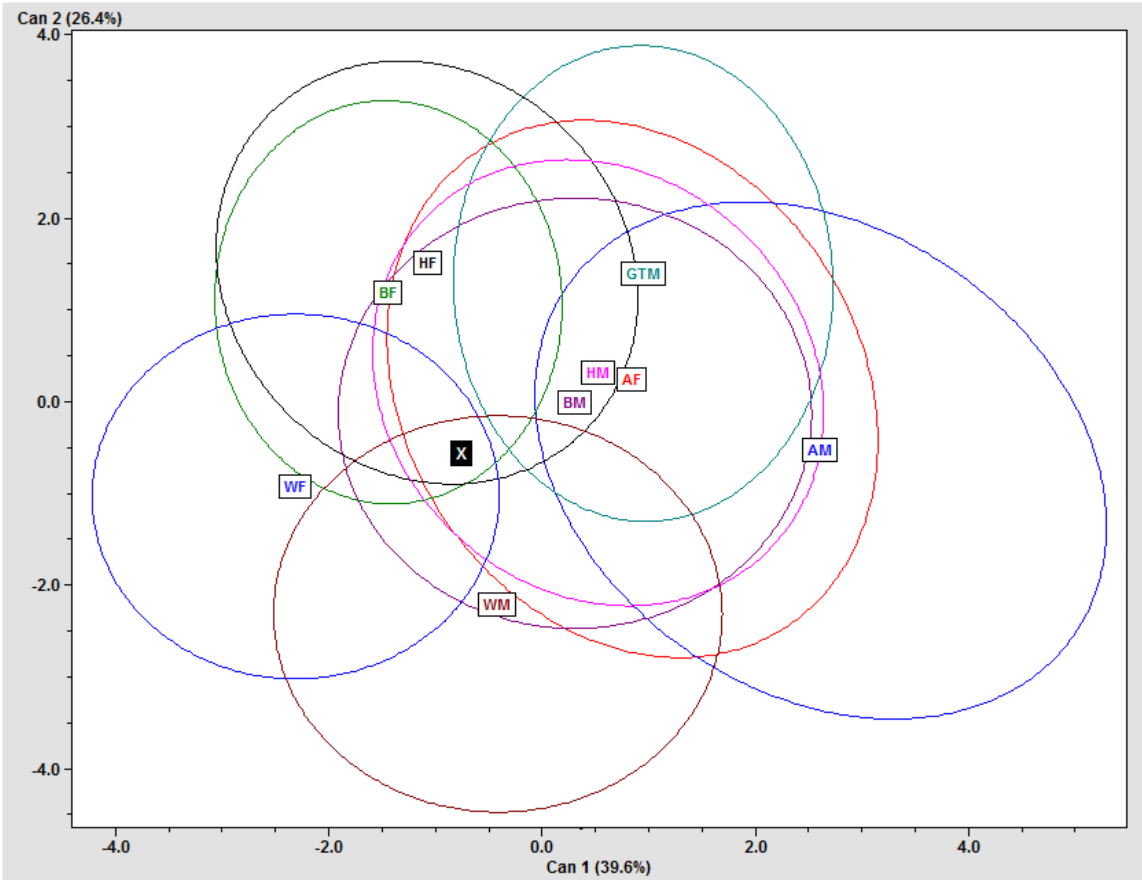

Figure 22 FORDISC MRFC 344 Craniometrics

Howells just males

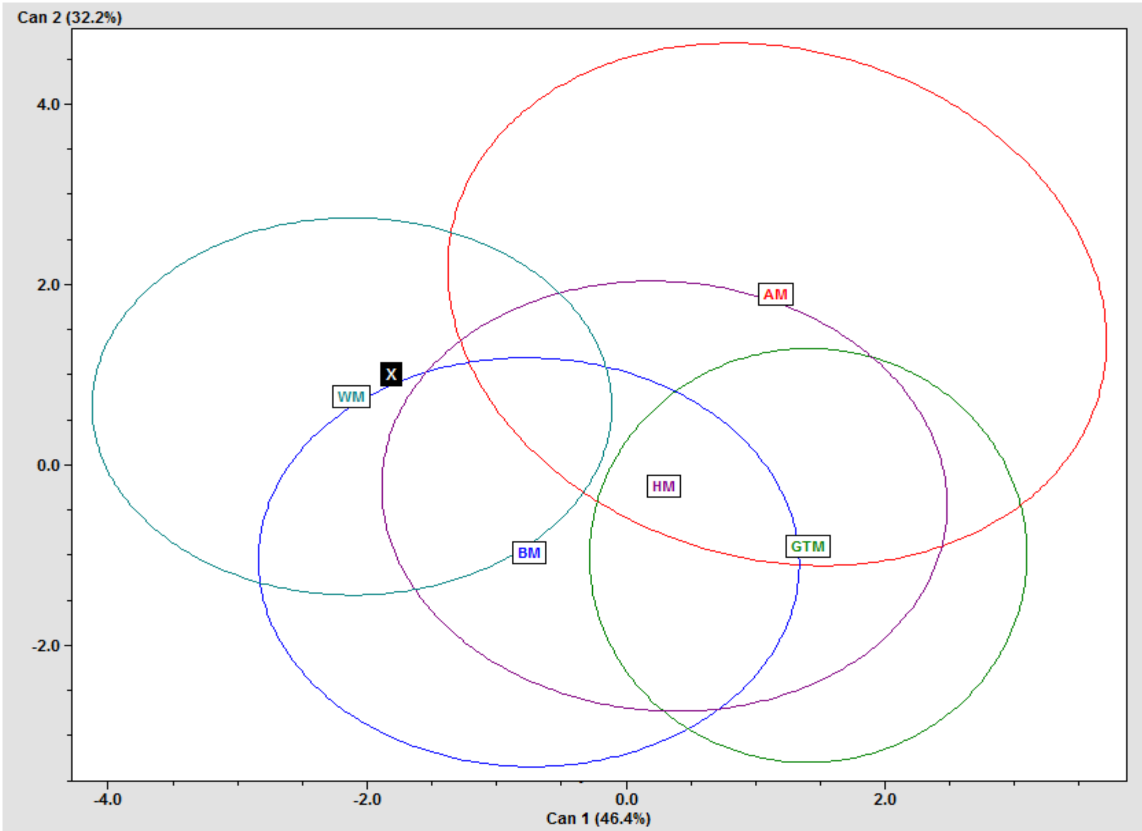

Figure 23 FORDISC MRFC 345 Craniometrics

Forensic Database (FDB)

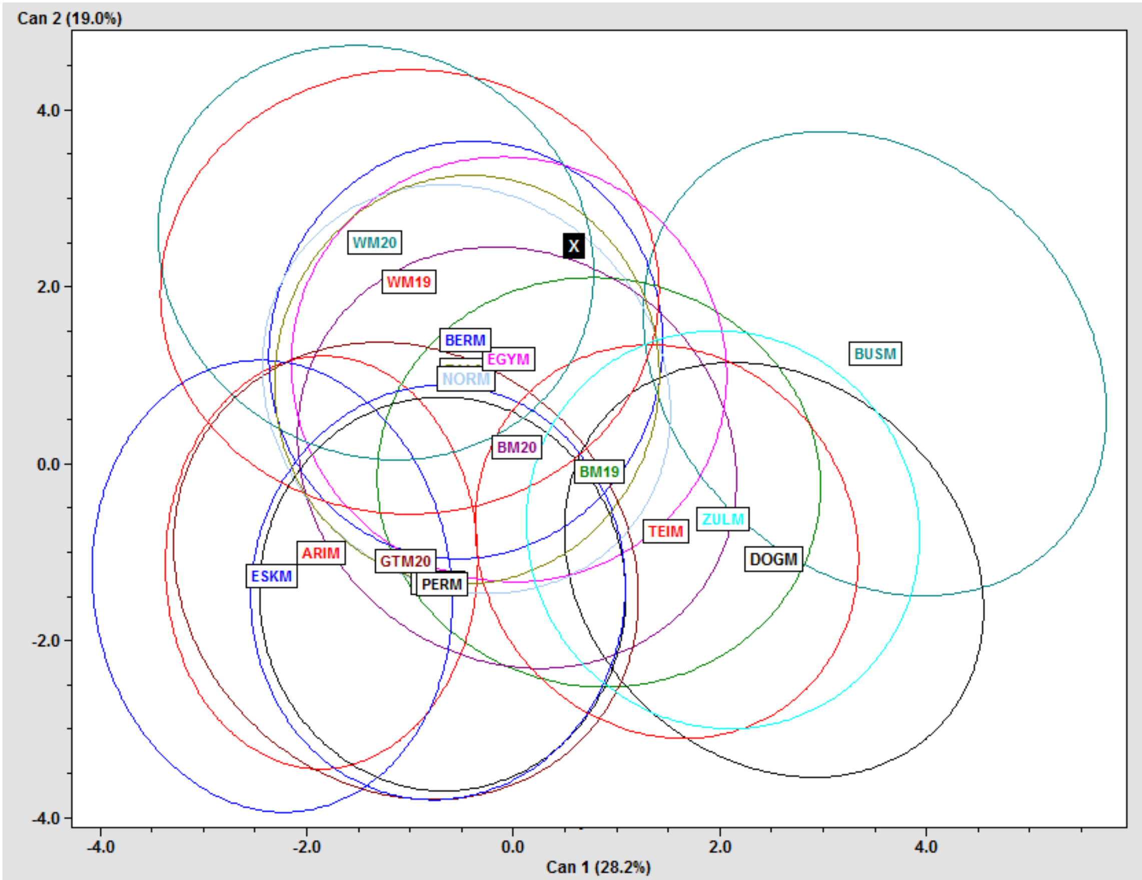

Figure 24 FORDICS MRFC 345 Craniometrics

Howells just males

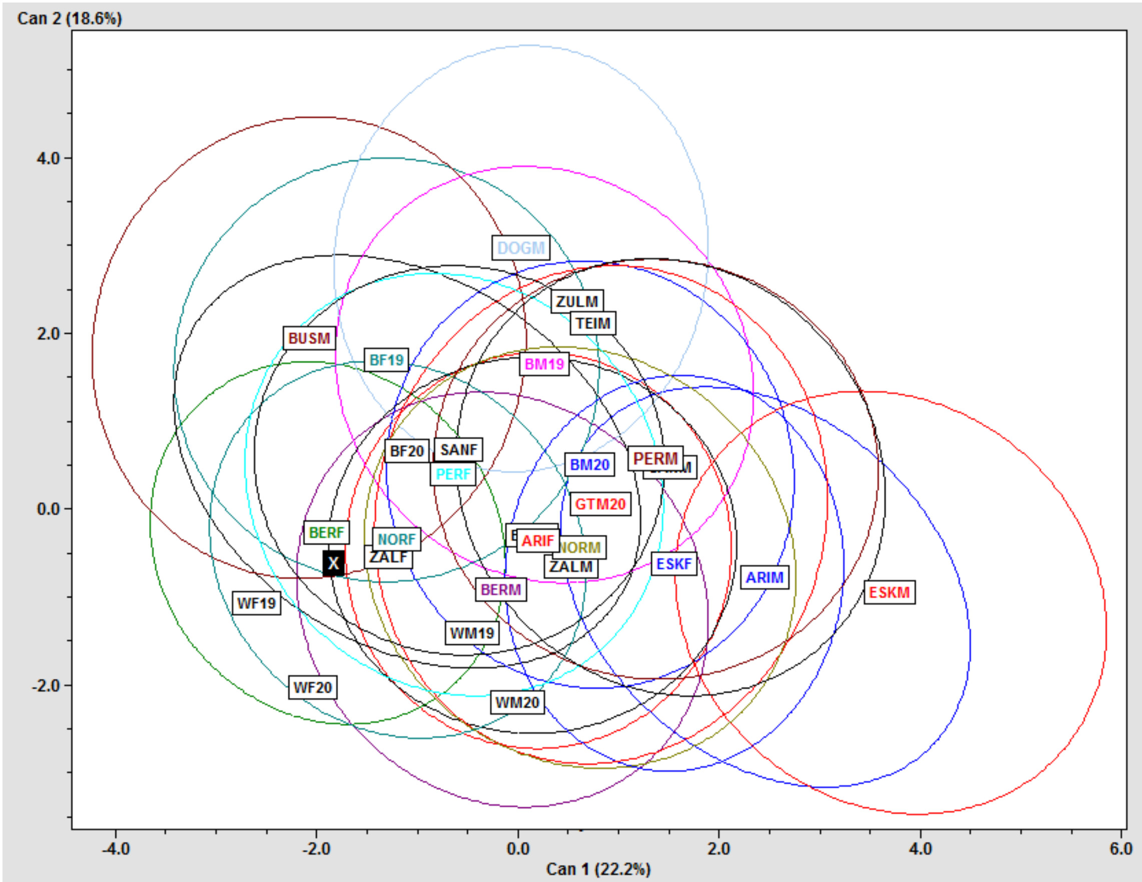

Figure 25 FORDISC MRFC 345 Craniometrics

Forensic Database (FDB)