Osteological Analysis of Remains from the Richards' Family Vault

Congressional Cemetery, Washington, D.C.

Erin N. Cullen
Dr. Douglas W. Owsley, Mentor

INTRODUCTION

Analyses conducted in the field of Physical Anthropology combined with historical research provide a more holistic approach to the interpretation of archaeological or burial excavations. Osteological research, in particular, adds a critical dimension to the understanding of the past, which the material culture alone cannot usually provide—namely the health and physique of a population. Osteological analyses also aid in identification by assessing demographic information, including age, sex, ancestry, and pathological conditions of an individual.

In the article *Mortuary Display and Status in a Nineteenth-Century Anglo-American Cemetery in Manassas, Virginia,* Barbara J. Little, Kim M. Lanphear and Douglas W. Owsley examine a series of skeletal and dental remains from the Weir Family, who were wealthy plantation owners. Similar to the Richards family from the Congressional Cemetery, the Weir family remains were also in very poor condition. While the bones were fragmentary, the dental remains were able to, "contribute substantially to the assessment of socioeconomic status" (1992:404). The authors explain the importance of dental pathology and the fact that it is, "influenced by diet, oral hygiene, and individual health" (1992:404).

Accordingly, these critical findings were essential in establishing a scientific hypothesis for the Richards family. While the majority of skeletal remains from the Richards family are extremely fragile and friable, the dental remains are fairly intact and provided definitive insights as to the nature of dental care available to a wealthy 19th century family in the mid-Atlantic region.

As part of assuring that a comprehensive osteological analysis was performed, carbon and nitrogen stable isotopes were examined for certain individuals in the vault. Stable isotope analysis can be used to identify human skeletal remains in that it can reveal dietary patterns evident from the carbon and nitrogen isotopic signatures left in human bone after food is consumed. Carbon present in human bone collagen is directly obtained from consumed food, making it a desirable source for stable isotopes (Ubelaker 1999:141). Although diets cannot be fully "reconstructed" using this type of analysis, stable isotopes can help establish similarities or differences in consumption patterns (Larsen 1997:270). In this particular study, the chemical analysis performed tested the human bone for two stable isotopes, carbon and nitrogen, in the bone collagen.

Research by Larsen indicates that each stable isotope can reveal information about the plants that were consumed by the individual – as well as animals and the plant elements the animal consumed – which may have been incorporated into the individual's diet. While maize had been available and readily consumed since the early Colonial period, a dietary shift to a more wheat based diet was evident near the end of the 19th century.

The purpose of this research is to understand the health and dietary patterns of wealthy individuals in the Washington, D.C. area from the mid-19th to the early 20th century. The skeletal identification and analysis of mid-late 19th century burials has been studied for many individuals of lower or middle status, throughout the Mid-Atlantic region. The analysis of high status individuals is not as common, in part, because many of these individuals are interred in more elaborate, generally inaccessible, and identifiable resting places (e.g., vaults), not in open fields which are "hot spots" for archaeological excavations.

In the case of the Richards family, the restoration of the deteriorating family vault combined with the need to remove family remains in advance of the restoration provided the unique opportunity to conduct the osteological analysis. All individuals from the Richards Family vault were systematically documented and removed by the Smithsonian Institution, under the supervision of Dr. Douglas Owsley, Division Head of the Physical Anthropology Department. The osteological analysis documented herein was performed by the author in collaboration with the Smithsonian Institution, the Historic Congressional Cemetery, Joseph Richards III, and Stevenson University.

BACKGROUND

Physical Anthropology

Physical Anthropology is the subfield of anthropology that deals with human and nonhuman primate evolution, the biological bases of human behavior, and human biological variability and its significance. The techniques in this field can be used to assist in the recovery of remains, assess demographic information (age, sex and ancestry) and analyze pathological conditions (trauma or disease). They can also be used in modern day criminal investigations and on historic and pre-historic archaeological excavations, where human skeletal remains are found. When the application of the science of physical anthropology and human osteology are used in a legal setting, the term forensic anthropology is deemed appropriate.

Historic Congressional Cemetery

The individuals examined in this study are part of an archaeological endeavor, and were excavated from the Richards family vault in the Historic Congressional Cemetery, in Southeast Washington, D.C. The vault is located to the east and slightly south of the cemetery's present day chapel. Congressional Cemetery "was founded in 1807 by a group of citizens residing in the eastern section of the new federal City of Washington" (Breitkreutz 2003:7). The cemetery later became the sole place of burial in Washington for members of Congress.

There are a handful of vaults in the Congressional Cemetery that are undergoing renovation. Built in the 19th century, many of these vaults are in need of restoration and repair. The mortar has weakened in between the bricks and ground erosion is occurring. Prior to commencing the renovation process, all human skeletal remains must be removed from the vaults, so as not to damage the aging, fragile remains.

Richards' Family Vault

Construction of the Richards family vault dates from January 1854. The vault remains and contains 16 burial chambers (four rows of four), half of which are above ground. The dates of death for individuals interred in this vault range from 1851 (a burial which was moved into the vault from another location after the construction was completed) to 1952. The latest burial to be analyzed in this study dates to 1920.

The patriarch of the family, Mr. Alfred Richards, was a well-known brick maker and one of the pioneers in the manufacture of brick in the city of Washington, D.C. As of 1894, the year that Mr. Richards passed away, it has been observed that there were few squares in the city, if any, which did not bear witness to his industry and enterprise. Mr. Richards lived a long and prosperous life. Throughout his life he married three times. His first wife was Elizabeth Jane Catherine Richards who died in 1851; his second wife was Grace Louise "Gracy" Montgomery Richards who died in 1865; and his third was Mary Alice Stewart Richards who died in 1892. When Alfred Richards died in 1894, he was survived by six sons and four daughters, some of whom were later interred in the Richards family vault, along with several of his grandchildren.

The Richards family vault, one of the most intact vaults in the cemetery because of prior repairs, is undergoing renovation. Joseph Richards III, one of the descendants of Mr. Alfred Richards, contacted Dr. Owsley, and requested his assistance in the identification and analysis of the Richards' ancestors.

OSTEOLOGICAL ANALYSIS

Skeletal Analysis

Accurate age, sex and race determinates are essential when analyzing skeletal remains, especially when comparing samples from various series. Demographic profiles developed from morphological, metric and multivariate statistical data provide a basis for studying trends and patterns of mortality and morbidity within and among families and populations. The initial step in obtaining the necessary basic data for these is determining an individual bone inventory for each skeleton, no matter how fragmentary the bone or how many elements are missing.

Methodology

The skeletal and dental analyses of individuals from the Richards family vault were conducted in a manner consistent with the normal procedures used by Dr. Owsley and his team for analyzing historical remains. The protocols for analyzing each set of skeletal remains include an inventory of the bones present and their condition, teeth present and their condition (including taphonomic changes), and the stages and planes of dental wear. The skeletal and dental inventories were documented using the format created by Dr. Owsley. This tool uses a coding system to assign conditions to each bone, such as presence or absence and number of fragments, and allows the analyst to code dental disease (caries), abscesses, calculus, degree of decomposition, and antemortem tooth loss. The dental wear analysis is based on stages described by Smith (1984), and planes of wear as determined by generally accepted anatomical terminology. The skeletal analysis included determination of pathological conditions, coded using forms constructed by Dr. Owsley. This record documented and included generalized pathology caused by infectious processes, osteoarthritis, fractures, and other forms of trauma and disease.

In addition to the inventories, each set of remains was assessed to confirm the demographic information including age, sex, and ancestry. Each factor was assessed using several determinants of morphological variations as outlined in Bass (1992) and Ubelaker (1999). The age of almost all the existing remains was determined using historical documentation, and confirmed using factors such as epiphyseal union, long bone growth and dental development for subadult individuals; and the amount of tooth wear and presence of osteoarthritic changes in all other individuals. Sex was originally identified for a majority of the individuals from this series by documentation provided by Joseph Richards III and the Historic Congressional Cemetery. It was confirmed using dimorphic differences such as the prominence of the mastoid process, the overall projection of the mandible, the gracile or robust attributes of long bones, and the pubis length and sciatic notch width of the innominates. Ancestry of these individuals is known to be Caucasian and was confirmed when the evaluation of dental remains revealed dental traits including cusps of Caribelli, a prominent feature for individuals of European ancestry.

Results

The skeletal analysis conducted for the Richards family vault (1) confirmed prior historical information that was obtained regarding the age, sex, ancestry and cause of death for a handful of individuals that were analyzed, and (2) provided information regarding lifestyle and general physical and dental health, as well as medical care available to this wealthy 19th century family. Appendix A provides demographic information for the individuals interred in the Richards family vault. The osteological analysis was performed with guidance and assistance from both Dr. Owsley and Kari Bruwelheide from the Smithsonian's National Museum of Natural History, Division of Physical Anthropology.

Age and Sex

This series consisted of three adult females, one elderly male, one sub-adult male, two female children, three infants (one female and two undetermined), and one fetus that was not assessed for sex. Ages ranged from five months in utero to 72 years old. The names and ages of eight of the individuals interred in the vault were provided by both Joseph Richards III and the Historic Congressional Cemetery (Appendix A). The sex of seven individuals was confirmed using various methods that examine the morphological features of the pelvic region, size of the mastoid processes, robusticity of the long bones, and morphological features of the mandible. An age range was identified for all of the individuals exhumed from the vault and was used in combination with available historical information to identify each individual. Ages of the children were determined using tooth crown development and stages of dental wear, evidence of lambdoidal suture closure, long bone diaphysis lengths, and epiphyseal union.

Ancestry

Of the individuals analyzed from the Richards' vault, ancestry was confirmed for only one member of the family. The lingual surfaces of the maxillary right first and third molars of Burial 2 have cusps of Carabelli, which are most commonly found in individuals of European ancestry. Various meetings and discussions with the descendants of Mr. Alfred Richards confirmed that all individuals were of European ancestry.

Dentition

An analysis of the dentition of the adults from the Richards family demonstrates that this population, while having poor dental health and a high rate of dental disease, had the means to obtain dental care to prevent further destruction of their teeth. Four of the adults (Burials 2, 5, 7 and 15) in this series present evidence of dental caries in the form of cavities; three of them (Burials 5, 7 and 15) received restoration work, which included a variety of gold and amalgam fillings. The eldest individual from this series, Alfred Richards (72 years old), was completely edentulous. He was buried with a full set of vulcanized rubber dentures with porcelain tooth sections, which is typical of late 19th century dental care (Swank, 2010).

An evolution in the field of dentistry is seen in the adults analyzed from this series, beginning with the earliest individual interred in the vault (1851) to the more recent (1920). The percentage of dental caries is determined from the number of teeth present from each burial. Beginning in 1851, Elizabeth Jane Catherine Richards exhibited dental caries in the form of cavities on 40% (four out of 10) of her teeth, yet no dental restoration was done to correct or prevent their destruction. By 1865, there is evidence of dental restoration in the form of gold fillings on two teeth from Grace Louise Montgomery Richards, who exhibited cavities on 80% (four out of five) of her teeth. Mary Alice Richards, who died in 1892, suffered from extreme dental disease, with 77% (20 out of 26) of her teeth exhibiting dental caries in the form of cavities. Eight of the 20 decayed teeth were restored with gold fillings, and seven were restored with amalgam fillings. By 1920, the restoration work observed on 29% (seven out of 24) of the teeth from Paul Harvey Cushing Richards consists of only amalgam fillings, some containing copper. The evolution of dental restorative material used to restore the function, integrity and morphology of the missing tooth structure is visibly apparent in the individuals from the Richards' family vault.

Taphonomy

The skeletal remains in this series are generally in poor condition. Many of the remains are severely damaged, with postmortem corrosion and breakage caused by the decomposition process of brushite formation. The remains are generally dark brown to light tan in color; any brushite formations are revealed by whitish colored crystals on both the interior and/or exterior of the bone. Two forms of staining were seen on individuals from the Richards family vault, and were most likely caused by material artifacts that are traditionally associated with burials, such as jewelry, shroud pins, buttons and nails. Copper oxide (green) staining is present on the left third metacarpal of Burial 7, possibly associated with a ring that was on her finger at the time of burial. Iron oxide (red) staining is present on the tibiae from Burial 6; the origin of which is undetermined.

Functional Morphology

Activity levels of two adults, interred in the Richards family vault, were identified when analyzing their skeletal remains. Burial 5 (Grace Louise Montgomery Richards, aged 39 years) showed slight development of her muscle attachment sites, representative of someone who is less active and most likely working around the home. Burial 7 (Mary Alice Richards, aged 48 years) was determined to be right-handed, due to the slightly raised ridges for attachment of pectoralis major, on the right humerus.

Pathology

Pathological conditions can result from infectious processes, age-related degeneration, heredity, traumatic injury, and dietary inadequacy (Ubelaker, 1999:96). The examination of skeletal pathology is useful for determining nutritional deficiencies, disease and trauma. Evidence of these various conditions is apparent on four of the individuals from this series, ranging from mild to severe. Half of the pathological findings are apparent on the adults from the Richards family vault, and two of the children show pathology, one of them with a severe nutritional deficiency. Burial 1 (Marion Grace Richards, aged 3 years) exhibits fusion of the third and fourth cervical left arches of the vertebrae, most likely a congenital anomaly or less likely a healed fracture. Burial 12 (an unidentified child, aged 5 to 6 months) shows a defined growth arrest line, likely from a severe illness or malnutrition.

Although brushite formation has destroyed many skeletal remains from the adults in this series, select individuals show pathological conditions associated with aging, congenital conditions, and trauma. Burial 6 shows marked anterior angular kyphosis of the T8 to T12 vertebrae, compression of the T9 vertebra, signs of arthritis, extensive ossification of rib costal cartilage and slight enthesophyte (bone spur) formations. This individual also shows a hereditary congenital defect, known as tarso-metatarsal coalition, in which the third right metatarsal was joined with the third right phalanx, a condition usually present during childhood or early adolescence. This condition probably would not have caused significant pain or discomfort. The historical documentation as to an illness related to the cause of death of Alfred Richards was also apparent during a pathological analysis. The death certificate of Alfred Richards (provided by the family) stated that his cause of death was related to pulmonary edema and diabetes mellitus. Antemortem amputation of four of his toes (three right metatarsals and a left proximal phalanx) was likely caused from complications associated with his diabetes mellitus. Burial 7 exhibits milder signs of aging with only slight arthritis, and a congenital anomaly in which she has an extra vertebra and 13th ribs. Burial 15 did not exhibit any pathological conditions on the skeletal remains themselves; however, both the brain and stomach contents of this individual were mummified. The stomach contents revealed evidence of grape seeds, scientifically known as *Vitis riparia*, which were identified by Jun Wen, a specialist in the Department of Botany at the Smithsonian's National Museum of Natural History.

This skeletal analysis assembles a composite picture of the general health and well being of the Richards family during life, although it should not be considered representative of the population as a whole in the Washington, D.C. area from the mid-19th into the early-20th century. Comparative analysis with other wealthy families in the region is required to gain insight into the life of the upper-class of this time period. This skeletal analysis does provide information about this particular family. The wealth of the Richards family is apparent from the dental restorations that were received, and the health care that was provided. It is also evident that these individuals were not routinely engaged in heavy physical labor. The majority of their pathological conditions are either congenital anomalies or normal signs of the aging process, with the exception of Alfred Richards, who had diabetes mellitus, which contributed to his death.

CARBON AND NITROGEN STABLE ISOTOPE ANALYSIS

The use of stable isotope analysis to evaluate food consumption has proven very useful in the reconstruction of past subsistence practices. However, it is important to remember that this technique should not be used as an independent method of diet reconstruction, specifically "because the interpretation of isotopic compositions is based on the comparison of values measured in human bone collagen with those measured for items identified as having been consumed, and because isotopic compositions can only be used to distinguish certain food groups rather than individual food items" (Keegan, 1989:224). This analysis is useful in refining dietary reconstructions and should be used in combination with other sources of evidence.

According to Katzenberg (2003), carbon and nitrogen stable isotopes are those most commonly studied in human remains. This is likely due to the fact that these isotopes have proven to be the most useful for studying the movement of nutrients through food chains, indicative of the fact that they are the building blocks of organic molecules. Traces of stable carbon isotopes (13C and 12C) and stable nitrogen isotopes (14N and 15N) can be found in human bone long after death, assuming the bone has not been severely destroyed from taphonomic or postmortem changes. Because these isotopes "do not decay over time" (Katzenberg, 2000:307), as contrasted with unstable isotopes (14C), they are ideal for dietary testing.

Since the human body's main sources of basic building blocks such as amino acids and fatty acids are derived from what we eat and drink, the isotopic signatures of the most abundant elements in our body, namely hydrogen, nitrogen, carbon and oxygen contain a record of the isotopic make-up of our dietary intake (Meier-Augenstein, 2007:153). The carbon and nitrogen stable isotopes analyzed in human bone collagen from this series, provide information on the dietary aspects of the individuals represented. The values expressed show the amount of carbon and nitrogen that each individual has consumed from living organisms throughout their lifetime. These values are expressed as ratios, where the proportion of 13C to 12C is compared to an accepted "standard," and hence given a value of δ13C‰. Similarly, the ratio of 14N and 15N is expressed as δ15N‰. The percentages are expressed in parts per thousand (‰) because their absolute differences in isotopic abundances are relatively small (Keegan, 1989:225). Bone collagen is considered well-preserved, and should be used for testing when the ratio falls between 2.9 and 3.6 (Ubelaker and Owsley 2003:134). In stable isotope analysis, it is important to remember the values of plants at the base of the food webs and their significance in dietary analysis. Values of δ13C‰ are represented on the negative side of the number scale. Conversely, δ15N‰ values are represented on the positive side of the number scale.

According to Ubelaker and Owsley (2003), who researched isotopes to examine the diets of American colonists, stable carbon isotopes quantified from preserved tissue indicate whether a diet was based on plants with a C3 photosynthetic pathway and/or the animals that consume them, or on plants with a C4 pathway and/or the herbivores that consume them. Their research determined that this was a useful method of distinguishing immigrants from those born in the continental United States. The plants with a C3 pathway include all trees and shrubs and most leafy-plants growing in temperate climates, such as wheat, rice, trees, nuts, fruits and root crops (Ubelaker and Owsley,

2003:130). Grasses such as maize, millet and sugarcane are characterized as C4 plants. A typical δ13C value for individuals consuming primarily C3 plants is roughly -20‰. A less-negative value of δ13C reflects a greater consumption of C4 plants, the animals that have consumed them, and/or the consumption of marine foods (Ubelaker and Owsley, 2003:130). Carbon values as high as -6‰ have been identified in bone collagen, from consumers of C4 plants. In stable isotope analysis, this means that a more negative value of δ13C‰ would likely indicate a diet richer in perhaps wheat or rice, and a less negative value of δ13C‰ would likely indicate a diet more consistent with corn or sugar. High levels of δ15N‰ are usually associated with a higher trophic level or location in an ecological food web. This is because the values represent protein intake primarily from animal sources, "making them better suited to distinguishing habitat-specific differences in diet" (Keegan, 1989:229). Individuals with a diet richer in plant foods are more likely to have lesser δ15N values than those from coastal areas consuming abundant seafood or diets higher in meat (Ubelaker and Owsley, 2003:131).

Methodology

In this study, stable isotope analyses were conducted using bones or bone fragments with solid cortical or dense bone, due to its high concentration of collagen. The isolated or fragmentary bone elements were carefully documented prior to chemical testing, because this process necessitates destruction of the bone piece. Bone samples were analyzed from seven of the 11 individuals exhumed from the vault. Isotope samples of the infants and young children (under the age of three years) were not analyzed, because an individual's actual diet is not reflected until they have been weaned.

Dietary patterns were examined for six of the seven individuals interred in the Richards family vault, by analyzing the carbon and nitrogen isotopic signature in their bone. Testing was conducted by Christine France, a Physical Scientist from the Smithsonian's *Museum Conservation Institute*, and results were analyzed by the author. The skeletal elements selected for testing were chosen after a thorough examination was conducted of all skeletal remains.

Results

Appendix B summarizes information on age, sex, and data from isotopic analysis for each of the seven individuals from the Richards' family vault. Information on the relative preservation of collagen is provided in the carbon to nitrogen ratio obtained during testing. One value, 3.96 from 51RICHARDS-CC-01, exceeds the acceptable value range of 2.9 to 3.6. Accordingly, this value was considered potentially less reliable and was excluded from the analysis. All other values obtained from this study fall within the acceptable range.

As illustrated in Appendix B, the δ13C‰ values range from -12.78‰ to -16.37‰ (with a mean of -13.97‰). Individuals with a date of death ranging from 1851 to 1892 have a less negative δ13C‰ value, indicative of a diet more reliant on C4 based plants, such as maize. One individual, Alfred Richards (51RICHARDS-CC-06) who died in 1894, has a δ13C‰ value of -14.64‰. This value is consistent with someone who consumed a mixed diet of wheat and maize. The remains of Paul Harvey Cushing Richards (51RICHARDS-CC-15) who died in 1920, have a δ13C‰ value of -16.37‰. This is the highest negative value in the series, illustrating a much heavier reliance on wheat based foods. An increase in the importation of wheat and the advancement of wheat production, milling and transportation at the turn of the century (USDA, 2009:1) resulting in greater access to wheat products, is the most likely cause for these findings.

There is less variation in the δ15N‰ values, which range from 11.32‰ to 12.81‰ (with a mean of 12.07‰). Human consumers of terrestrial plants and animals typically have δ15N‰ values in bone collagen of about 6‰ to 10‰ whereas consumers of freshwater or marine fish may have δ15N‰ values of 15‰ to 20‰ (Schoeninger, DeNiro and Tauber, 1983). The individuals selected for analysis from this series seem to have a varied diet, comprised of both marine foods and maize or animal protein from corn fed domestic animals. A slight decrease in the δ15N‰ values was also apparent in individuals ranging from a date of death of 1884 to 1920. This decrease could indicate either the prevalence towards a more marine based diet, a decline in the consumption of protein from meat, near the end of the 19th and into the early 20th century, or simply, the differences in dietary preference of each individual. The interpretation of dietary aspects is limited to the sample size of individuals tested from this series. Dietary patterns of wealthy individuals at the turn of the century could possibly be revealed by increasing the sample size and comparing the diets of Richards family members to other individuals of similar socioeconomic status residing in the mid-Atlantic region.

CONCLUSIONS

The osteological analyses conducted for the Richards family members provides valuable insights into the overall health and dietary patterns of these wealthy individuals in the Washington, D.C. area from the mid-19th to the early 20th century. The wealth of the Richards family is apparent from the dental restorations conducted and the health care that was provided. Although Alfred Richards' overall health was deteriorating at the time of his death, his socioeconomic position enabled him to receive significant medical treatment (e.g., dentures, amputation of toes). It is evident that Richards family members were not hard laborers – suggesting an existence primarily in the home – and that a majority of their pathological conditions are either congenital anomalies or normal signs of the aging process, with the exception of Alfred Richards, who had a known disease, which contributed to his death. The evolution of dental restorative material used to restore

the function, integrity and morphology of the missing tooth structure is visibly apparent in the individuals from the Richards' family vault. Four of the family members received significant dental work – the need for which may have been driven by consumption of items reflective of the family's wealth (e.g., sugar).

The dietary habits reconstruction of individuals from the Richards family vault holds considerable potential in revealing a typical dietary pattern of wealthy individuals at the turn of the century in the mid-Atlantic region. A decrease in δ13C‰ and δ15N‰ values towards the end of the 19th century shows a transition from a more corn-based diet to one more reliant on wheat products – which itself is reflective of the evolution of food processing technology. The decrease in δ15N‰ around the same time period points to either a prevalence towards a more marine-based diet or a decline in the consumption of protein from meat.

The results of this work suggest the following future related research activities: 1) expand the examination to other individuals of the same socioeconomic standing who are interred at the Congressional Cemetery to determine if the patterns identified herein can be corroborated; 2) focus on dietary patterns at the turn of the century to determine evidence of any significant change in carbon and/or nitrogen isotopic signatures; and 3) specifically examine the material artifacts associated with the Richards family vault to determine any conclusions regarding burial display at the turn of the century.

REFERENCES

Bass, W. H. (1992). *Human Osteology: A Laboratory and Field Manual* (M. K. Trimble, Ed., 3rd ed.). Columbia: Missouri Archaeological Society.

Breitkreutz, C. (2003). *Historic Congressional Cemetery: Developmental History*. Retrieved from Association for the Preservation of the Historical Congressional Cemetary website: http://www.congressionalcemetery.org/sites/default/files/2002BreitkreutzHistoryrfs.pdf

General Electric. (2010). Growth arrest lines. In *Medical Diagnostics: Medcyclopaedia*. Retrieved from http://www.medcyclopaedia.com/library/topics/volume_vii/g/growth_arrest_lines.aspx

Katzenberg, M. A. (2000). Stable Isotope Analysis: A Tool for Studying Past Diet, Demography, and Life History. In *Biological Anthropology of the Human Skeleton* (pp. 305-327). New York: John Wiley and Sons.

Keegan, W. F. (1989). Stable Isotope Analysis of Prehistoric Diet. In *Reconstruction of Life From the Human Skeleton*. (pp. 223-236). New York: Alan R. Liss, Inc.

Larsen, C. S. (1997). *Bioarchaeology: Interpreting behavior from the human skeleton*. Cambridge University Press.

Little, B. J., Lanphear, K. M., & Owsley, D. W. (1992). Mortuary Display and Status in a Nineteenth-Century Anglo-American Cemetery in Manassas, Virginia. *American Antiquity*, 57(3), 397-418.

Mays, S. (1998). *The Archaeology of Human Bones*. Routledge, London.

Meier-Augenstein, W., & Fraser, I. (2008). Forensic isotope analysis leads to identification of a mutilated murder victim. *Science and Justice*, 48, 153-159.

Schoeninger, M. J., DeNiro, M. J., & Tauber, H. (1983, June). Stable Nitrogen Isotope Ratios of Bone Collagen Reflect Marine and Terrestrial Components of Prehistoric Human Diet. *Science*, 220, 1381-1383.

Smith, B. H. (1984). Patterns of molar wear in hunter-gatherers and agriculturalists. *American Journal of Physical Anthropology*, 63(1), 39-56.

Swank, Scott D. The Dr. Samuel D. Harris National Museum of Dentistry, Curator. Interview. (January, 25, 2010)

Ubelaker, D. H. (1999). *Human Skeletal Remains: Excavation, Analysis, Interpretation*. Washington: Taraxacum.

Ubelaker, D. H., & Owsley, D. W. (2003). Isotopic Evidence for Diet in the Seventeenth-Century Colonial Chesapeake. *American Antiquity*, 68(1), 129-139.

United States Department of Agriculture. (2009, March 17). *Wheat's Role in the U.S. Diet Has Changed Over the Decades*. Retrieved from http://ers.usda.gov/briefing/wheat/consumption.htm.

ABOUT THE AUTHOR

Erin N. Cullen is a recent graduate from Stevenson University, receiving her Masters in Forensic Science. Since 2002 she has worked for Anne Arundel County's Lost Towns Project as an archaeologist and Laboratory Director. After discovering a few historic burials throughout the county she became very interested in Forensic Anthropology. Attending Stevenson University gave her the opportunity to pursue her interests, and also allowed her to obtain a prestigious internship at the Smithsonian's Natural History Museum in Washington, D.C. where she conducted her thesis research.

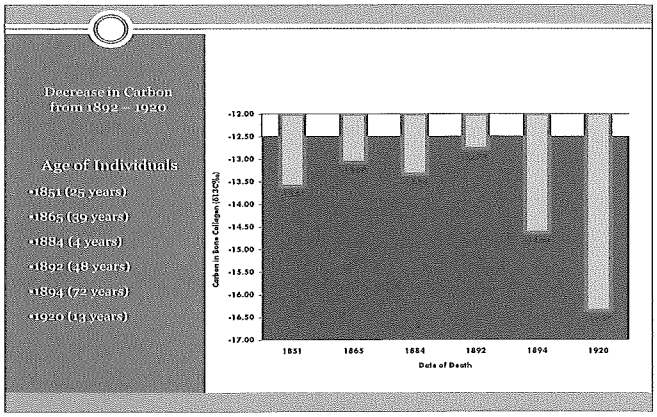
APPENDIX A: DEMOGRAPHIC INFORMATION FOR INDIVIDUALS INTERRED IN THE RICHARDS FAMILY VAULT

BURIAL #	NAME (HISTORIC DOCUMENTATION)	FAMILY RELATION TO ALFRED RICHARDS	DATE OF DEATH	AGE IN YEARS	ANCESTRY (HISTORIC DOCUMENTATION)	SEX
1	Marion Grace Richards	Daughter with Second Wife	1863	3	White	F
2	Elizabeth Jane Catherine Richards	First Wife	1851	25	White	F
3	Grace Louise Helen Richards	Grandaughter from Third Wife	1908	7 months 21 days	White	F
4A	Ida Richards	Daughter with Third Wife	1884	4	White	F
4B	Unknown	Unknown	N/A	fetus	White	N/A
5	Grace Louise Montgomery Richards	Second Wife	1865	39	White	F
6	Alfred Richards	(Patriarch)	1894	72	White	M
7	Mary Alice Richards	Third Wife	1892	48	White	F
8	Unknown	Unknown	N/A	3-4 months	Probable White	N/A
9	Empty Chamber	N/A	N/A	N/A	N/A	N/A
10	Daughter of Joan Richards Galliher	Unknown	1952	N/A	White	F
11	Edward Noble Richards	Son with Third Wife	1908	33	White	M
12	Unknown	Unknown	N/A	5-6 months	Probable White	N/A
13	Empty Chamber	N/A	N/A	N/A	N/A	N/A
14	Empty Chamber	N/A	N/A	N/A	N/A	N/A
15	Paul Harvey Cushing Richards	Grandson from Third Wife	1920	13	White	M
16	Empty Chamber	N/A	N/A	N/A	N/A	N/A

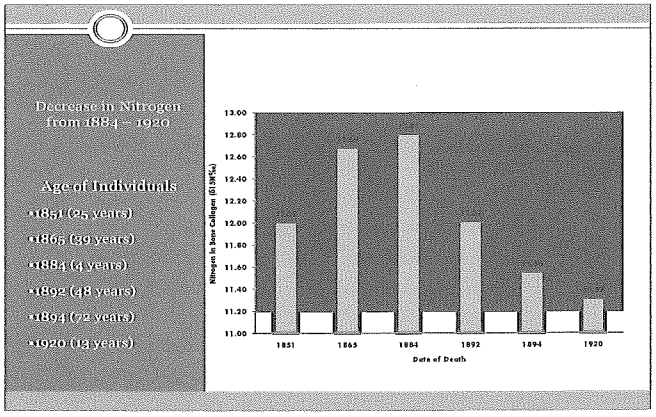
Note: Burials highlighted in ☐ were not exhumed from the vault. Burials highlighted in ■ were empty and no skeletal remains were evident.

APPENDIX B: STABLE ISOTOPE ANALYSIS

Stable Isotope Results for the Richards Family Vault in Congressional Cemetery, Washington D.C.



Date of Death and Carbon in Bone Collagen



Date of Death and Nitrogen in Bone Collagen