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Bioarchaeological Analysis of Oak View Landing (40Dr1): An Archaic Population in the Kentucky Lake Reservior

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BIOARCHAEOLOGICAL ANALYSIS OF OAK VIEW LANDING (40DR1): AN
ARCHAIC POPULATION IN THE KENTUCKY LAKE RESERVIOR

by

Katy DeAnna Grant-McLemore

A Thesis
Submitted to the Graduate School
and the Department of Anthropology and Sociology
at The University of Southern Mississippi
in Partial Fulfillment of the Requirements
For the Degree of Master of Arts

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ABSTRACT

BIOARCHAEOLOGICAL ANALYSIS OF OAK VIEW LANDING (40DR1): AN ARCHAIC POPULATION IN THE KENTUCKY LAKE RESERVOIR

by Katy DeAnna Grant-McLemore

December 2015

The biocultural examination of the Archaic population recovered at Oak View Landing (40DR1) investigates the lifeways and adaptations of prehistoric people as they reflect sociopolitical and subsistence strategies.

A comprehensive bioarchaeological analysis was conducted on the adult individuals (18 males, 16 females, 16 of indeterminate sex) excavated from a multiple occupation site located along the Tennessee River in Decatur County, Tennessee. Skeletal indicators used to understand biocultural phenomena were assessed macroscopically on cranial and postcranial elements. Furthermore, mortuary data, for adults and subadults, were used to determine any patterns of preferential treatment at death.

Results from this study indicate that these individuals were tall in stature and experienced a low prevalence of metabolic disease (0/43) and infection (4/50). Rates of arthritis (20/50) and trauma, especially to cranial and forearm bones, (14/50) were high. Archaic populations have been shown to be highly active; thus the high prevalence of arthritis and trauma is not unexpected. Surprisingly, oral health showed a higher frequency of pathologies than expected, possibly due to increased exploitation of starchy seeds, as did the frequencies of linear enamel hypoplasias. With exceptions, the results from this

study were congruent with other foraging groups. However, they may have experienced hardships due to harsh seasonal conditions resulting in increased competition for resources as shown by the morbidity observed in males, and the high rate of violent trauma, especially in females. Therefore, lifeways during the Archaic were not as homogenous as traditionally thought.

DEDICATION

I would like to dedicate my thesis to my loving, patient children, Braden Alexander Grant and Adeline Mae McLemore.

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I would like to thank my thesis committee chair, Dr. Marie Danforth, whose patience, encouragement, and knowledge have proven to be limitless. I would like to thank my other committee members, Dr. H. Edwin Jackson and Dr. Amy Young, for their much-needed contributions and varying perspectives. I would also like to thank the staff members, particularly Dr. Lynne Sullivan and Dr. Tim Baumann, at the McClung Museum of Natural History and Culture, whose permission to examine this skeletal series made this research possible. Finally, I would like to thank my classmates and cohort for the perspectives and knowledge they have gained in the field of Anthropology.

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CHAPTER I

INTRODUCTION

Bioarchaeological research conducted in the Southeastern United States has largely been focused on the Mississippian period - a time which experienced an increase in population size, political complexity, and the transition from a foraging subsistence strategy to food production, and as a result, significant decline in overall health (e.g., Ambrose, Buikstra, & Krueger, 2003; Hedman, 2006; Hogue, 2007; Powell, 1991; Rose, Marks, & Tieszen, 1991). The health patterns of the earlier Archaic populations, however, have received comparatively less attention in the literature and are represented as monolithic. With the exception of some large Archaic skeletal series, such as Indian Knoll (Cassidy, 1984; Kelley, 1980), small Archaic populations are especially underrepresented despite the possible biocultural wealth of information that would benefit our knowledge of the lifeways of prehistoric people in the Southeast. Comprehensive examinations of these groups may provide new information about differences in health patterns as they reflect adaptation in relationship to environmental differences by region (e.g., terrain and available resources).

A few investigations have been conducted with the use of limited Archaic skeletal series or single Archaic individuals; these studies, however, have not been comprehensive in nature (e.g., Janetski, Lupo, McCullough, & Novak, 1992; Smith, 1995; Smith, 2006). Instead, studies have focused on a single indicator such as metabolic disease. This is problematic because the lack of multifaceted

studies paints a narrow picture of past populations; whereas, a holistic approach results in a better understanding of the health and social structure of these groups. For this project, an Archaic group excavated from the Oak View Landing (40DR1) site, located in what is now referred to as the Kentucky Lake Reservoir (Smith, 1995), was examined for dietary reconstruction and patterns of disease, as well as mortuary practices. This biocultural investigation of the Oak View Landing group will prove beneficial to the ongoing research in understanding the lifeways and adaptations of prehistoric people who were not dependent on domestication.

The innate challenges of working with Archaic groups are appreciated. Firstly, burials of highly mobile populations, such as the Archaic, generally result in a limited number of cemeteries with ample human remains for researchers to confidently assess and make inferences. Secondly, due to simple mortuary practices (i.e., shallow grave pits) and duration of time since interment, preservation of human skeletal remains is often poor and results in few Archaic individuals to be examined. Though fragmentary, the Oak View Landing site series is one such assemblage that offers sufficient skeletal material for health assessment.

The adult individuals from the Oak View Landing site were examined for skeletal and dental lesions to analyze and interpret health patterns manifested in this sample. Determining stature, identifying the frequency and location of dental caries, and degree of tooth wear contributed to the reconstruction of dietary practices. Non-specific stress indicators (linear enamel hypoplasias [LEH],

porotic hyperostosis [PH], and cribra orbitalia [CO]) were used to determine age at time of stressful event or possible metabolic deficiencies due to varying etiologies. Additionally, infection (periostitis and osteomyelitis) and activity markers (trauma and degenerative joint disease [DJD]) of the skeleton were examined to deduce the relationship between environment and cultural setting. Biocultural examination of the relationship was investigated between mortuary practices and the individual interred based on demographic and pathological variables were also investigated at Oak View Landing.

Research Expectations

The aim of this thesis is to use the data collected from Archaic individuals excavated from Oak View Landing to have a more holistic understanding of the health and lifeways of those buried at the site as a single population.

At Oak View Landing, mortuary treatment was expected to reflect an egalitarian political organization with little to no disparity of status indicated between individuals, although adult males may have subtle preferential treatment during deposition due to achieved status (Kelley, 1980).

These Archaic individuals lived in a lush environment with access to a variety of foods (including those rich in protein); therefore, the overall health during life was anticipated to be good as a result of a favorable diet. Because this population was egalitarian and members of this group had equal access to food procurements, most individuals should have similar patterns of health indicators. It was expected that these individuals were tall in stature, the frequency of PH and CO should be low, and dental caries should be minimal; however, when

compared within group, results will indicate if the Oak View Landing sample is typical or skewed. Furthermore, the frequency of non-specific stress indicators (LEH) was expected to be low at Oak View Landing. Because this population implemented a foraging strategy, which is associated with an egalitarian political organization, it is likely that the population size was small; thus the rate of non-specific infectious disease was expected to be low, as these tend to flourish in densely populated groups (Ortner, 2008).

It was anticipated that the results from Oak View Landing should reflect similar health patterns found in other contemporaneous Archaic populations in similar environments; therefore, the findings from this study were compared with the results from additional adult Archaic (and/or foraging practicing) skeletal samples excavated from the Carrier Mills (Bassett, 1982), Indian Knoll (Kelley, 1980), Bluegrass (Mayes, 1997), and Elizabeth sites (Frankenberg, Albertson, & Kohn, 1988). Results were also compared with foraging groups from contrasting environments, such as the prehistoric Native Americans from the Northwestern Great Plains (Winn, 2012), Channel Islands of California (Kerr, 2004), and circumpolar regions (Yeats, 2011). It was expected that although these populations practiced a similar foraging subsistence strategy, the patterns of skeletal and dental lesions may differ as a result of varying resources and environments. Cross-cultural examination of the aforementioned populations will determine any cultural continuity as it pertains to health patterns or varying manifestations due to differing environments, despite similar cultural practices.

Contributions of the Thesis

Using the results from this study to compare with other Archaic populations may prove crucial in understanding the diversity of health and adaption in the Archaic stage of human prehistory. Though archeological evidence of cultural similarities binds these groups together, there may be subtle differences in the biocultural interactions due to regional differences between these Southeastern Archaic populations.

CHAPTER II

THE ARCHAIC PERIOD IN THE NEW WORLD

There is an abundance of research that has been conducted on Archaic culture looking at multiple lines of evidence which characterize the people of this prehistoric time period. Studies have examined changes in climate that resulted in a cultural adaptation which brought about change in technology, resource exploitation, settlement patterns, and sociopolitical organization. These investigations are reviewed in this chapter.

Archaeology of Archaic Cultures

Environmental Changes

The Archaic culture emerged in the Southeast during the Holocene epoch and ended at the beginning of modern climate conditions. It is divided into three periods: Early (10,000-8000 B.P.), Middle (8000-5000 B.P.), and Late (5000-3000 B.P.). During the Middle Holocene, a shift in climate, referred to as the Hypsithermal interval and spanning from 8000-4000 B.P., caused an environmental change across the Southeastern United States landscape. Climate, weather, and vegetation patterns trended toward modern conditions. Sea levels largely stabilized during this time, and previously braided streams became meandering channels in the river valleys (Schuldenrein, 1996). What were once “stable regional oak-hickory vegetational communities” (Anderson, O’Steen, & Sassaman, 1996, p. 4) were then transformed into a region of pine or mixed pine-oak communities. The breakup of closed canopy forests resulted in fewer useful deciduous species, but an increase in deer populations. These

paleoclimatic shifts brought about change in the abundance and type of resources available to past Southeastern populations (Anderson et al., 1996).

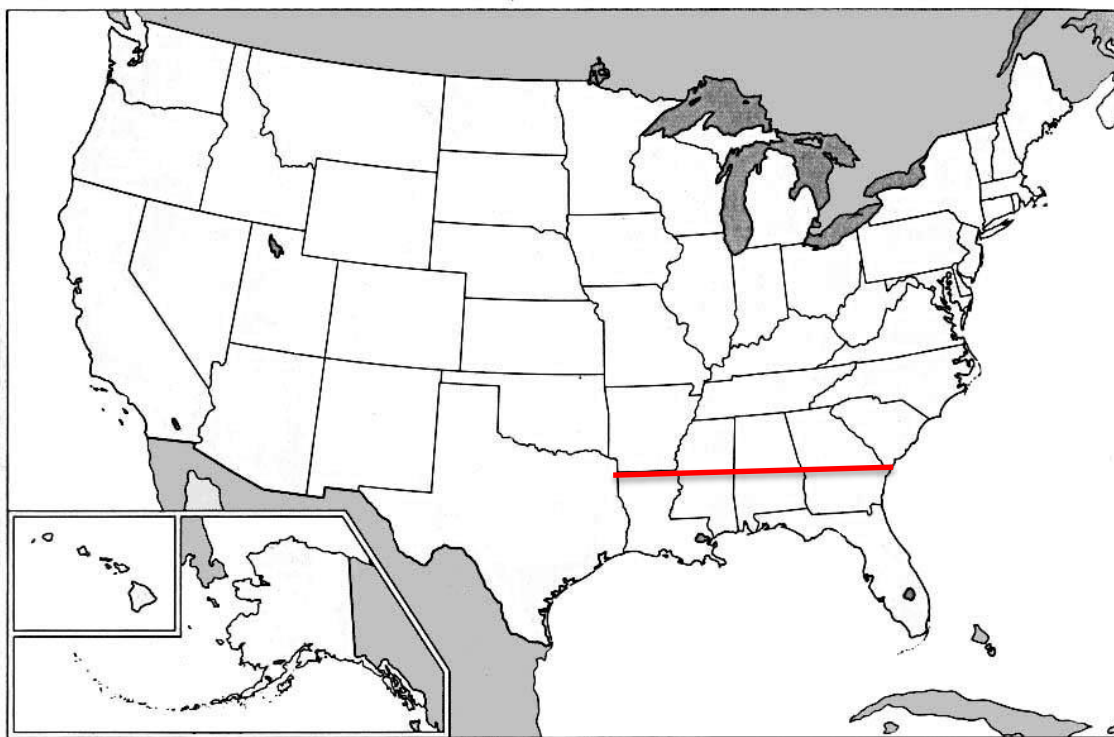


Figure 1. Map of the United States with the 33°N latitude line bisecting the Southeast shown in red.

According to Anderson et al. (1996), the changes in biotic resources during the Hypsothermal interval had direct influence over the adaptations of humans in this region. Culturally, humans began to adopt different technologies, mobility patterns, and social organization. The authors suggest that groups living north of 33°N, which roughly runs along the border of Arkansas and Louisiana and bisects Mississippi, Alabama, and Georgia (Figure 1), during this time may have practiced logistical collecting strategies that utilized a central base camp for individuals to return to after collecting resources; this procurement strategy is generally characterized by the use curated tool kits in colder heterogeneous, or

coarse-grained, environments. Conversely, groups living south of 33°N generally practiced a residential foraging subsistence strategy with the use of expedient tool kits in warmer homogenous, or undifferentiated, environments (Anderson et al., 1996; Cable, 1996; Geremillion, 1996).

Technology

In their synthesis of research concerning Archaic technology as it pertains to and reflects subsistence strategies, Amick and Carr (1996) highlight the changes that manifested from the Early to Middle Archaic such as a decrease in the size of land use, increase in the use of local raw materials, as well as an increase in expedient stone tools. Changes seen from the Middle to Late Archaic include an increase in the use of nonlocal raw materials, increase in curated technology, and “increased logistical mobility” (Amick & Carr, 1996, p. 53).

Innovative items have been associated with the Archaic adaptation for the proficient procurement and processing of resources. Ground and polished stone, including nutting stones, mortars and pestals, stone vessels, atlatl weights, and three-quarter- and full-grooved axes, began to be manufactured and used in the Middle Holocene. Additionally, ritual or ceremonial items such as boatstones and bannerstones also began to show up during the Middle Archaic period. The emergence of these innovations, in addition to their value in efficient use, is argued to be due to the need for alliance formation with the intent to form long standing economic relationships between groups (Jefferies, 1996; Sassaman, 1996).

Resource Exploitation

Floral and faunal studies of Archaic populations suggest that these groups were consuming mast (forest nuts that accumulate on the ground) such as hazelnuts, walnuts, hickory, and acorns (with hickory being most often found in Middle to Late Archaic). Nuts are argued to be the primary source of carbohydrates and vegetable fats for prehistoric hunter-gatherers. Fruits (e.g., hackberry, persimmon) were increasingly exploited, and the use of wild native seeds from weedy annuals (e.g., lambs quarter, sunflower, knotweed) is found at Archaic sites such as Windover in Florida (Geremillion, 1996; Newsom, 1988; Smith & Cowen, 1987).

According to Styles and Klippel (1996), although there is considerable variation among sites, there appears to be a general pattern of an increase in the exploitation of white-tailed deer and aquatic resources during the Middle Holocene. In the Midsouth, there was an increase in the exploitation of deer, waterfowl, fish, and shellfish. Greater use of aquatic resources (especially fish) is found at sites in major river valleys. Sites along interior rivers indicate a subsistence adaptation that exploited mussels (Styles & Klippel, 1996).

Settlement Patterns

Accompanying the increase in the diversity of adaptations seen in the prehistoric Southeast, there was an increase in residential permanence seen in some areas. The presence of substantial shelters in major floodplain areas and an increase in the exploitation of aquatic resources suggest an increase of settlement in these settings because of the wetland habitat caused by

precipitation increase and decrease in river channel gradients during the Late Archaic (Schuldenrein, 1996).

In a study to model Archaic settlement patterns, Anderson (1996) examined raw data of over 30,000 sites in the Southeast. Generally speaking, he found that there was an increase in the number of Archaic settlements over time, suggesting more and more groups occupying the region up through to the Late Archaic; but this pattern was not seen in all regions. Not only was there an increase in the number of settlements, but the residential stability and permanence also increased. Evidence that suggests this stability includes the appearance of large storage and small basin pits, prepared clay floors and post molds, and the appearance of cemeteries (Mikell & Saunders, 2007; Saunders et al., 2005; Walthall, 1999). These trends in settlement patterns are likely linked to the organization of technology and mobility or relocation and consolidation of groups in response to environmental pressures.

Sociopolitical Organization

The increase in sedentism may have decreased the constraints on family size, thus increasing population and causing the increase in the number of sites over time. This likely resulted in the overlap of territories and increase in social complexity. Trade relations began to be established to bank for future resources or maintain alliances (Jefferies, 1996).

Exchange networks established by prehistoric populations are seen with the appearance of nonlocal materials within a site; implications for exchange have been observed ethnographically as tools to create and maintain social ties

that provide “a variety of risk-averting mechanisms that could be operationalized in times of economic or social stress” (Jefferies, 1996, pp. 223-224). Evidence of these networks is seen in Archaic contexts (Jefferies, 1996). Data suggests that the development of networks began about 6000 B.P. and may have been “associated with increased sedentism and the breakdown of traditional communication and interaction mechanisms used by more mobile hunter-gatherer groups” (Jefferies, 1996, pp. 232-233) that occurred during the late Middle Archaic.

Although there may be a need for risk-aversion through the means of networks, Archaic populations were still functioning as egalitarian societies in which all individuals had equal access to wealth, resources, and prestige; there were, however, likely subtle differences based on age and sex (Flanagan, 1989) and the value of reciprocity encouraged individuals to share their resources within the group (Danforth, 1999).

Mortuary Practices

The egalitarian nature and band level political decision-making of Archaic populations resulted in a society without social stratification. Individuals in these societies, however, achieved status based on hierarchies of age and sex. According to Binford (1971) and Saxe (1970), these patterns of status should be reflected in mortuary practices. Nonetheless, mortuary analyses of Archaic groups have shown to be slightly contradictory to the Binford-Saxe model. According to various authors, contradictions may be due in part to the multifaceted nature of the human experience; such facets include personal

agency (Little, Lanphear, & Owsley, 1992), warfare (Seeman, 1988), mobility (Brunson, 1989), and trade (Carr, 1992). The diversity of mortuary practices, contrary to the Binford-Saxe model found in the Archaic archaeological record, suggests the treatment of the dead was not solely based on achieved status.

At Indian Knoll, “round graves” were typically circular pits with tightly-flexed individuals who were interred in various positions (i.e., both sides, face down, sitting) in order to fit within the pit (Webb, 1974). The burial position (flexed, semi-flexed, supine) of Archaic individuals at the Bluegrass site is highly variable with no apparent relationship to age and sex. However, there was a higher frequency of grave goods in association with adult males when compared with females and subadults (Mayes, 1997), similar sex based preference of grave inclusions was found at Indian Knoll (Rothschild, 1979). These results conflict with those found by Lynch (1982) at Carrier Mills where no statistically meaningful association of grave goods was found when age and sex were considered.

Additionally, in societies where status is achieved and not ascribed, it may be expected that infants would not have received preferential burial treatment. Although no infants at Bluegrass were associated with grave goods, several infants were associated with grave goods at Carrier Mills, and a substantial amount of grave goods were associated with infants at Indian Knoll (Lynch, 1982; Mayes, 1997; Webb, 1946). The concept of achieved status of political leaders, as it relates to funerary performance in these egalitarian bands, is not universally mirrored in the interment profile. Although extensive studies have not been

conducted on Archaic mortuary practices, it appears there are no contemporary population patterns when looking at types of interment as well as grave goods.

Archaic Health Patterns

Archaic populations have been shown to have been relatively healthy when compared to Mississippian populations due to their subsistence strategies resulting in a balanced diet that was not dependent on a limited range of resources, as seen in agriculture (Cassidy, 1984; Kelley, 1980). They were not, however, exempt from morbidity and mortality. In their comparative analyses of prehistoric populations, Kelley (1980) and Cassidy (1984) examined three prehistoric subsistence strategies, one of which was the foraging Archaic Indian Knoll population, and the other two were horticulturalists (Mobridge and Adena) and agriculturalists (Grasshopper Ruins and Fort Ancient). In addition to the Indian Knoll site, the Bluegrass (Mayes, 1997), Carrier Mills (Bassett, 1982), and Elizabeth (Frankenberg, Albertson, & Kohn, 1988) sites have been researched in a fairly comprehensive manner and will be used as comparative contemporaneous populations for this study.

Indian Knoll (Oh2)

Located in west-central Kentucky along the Green River, Indian Knoll is a multicomponent site with a long period of Archaic occupation of about 1300 years (Kelley, 1980; Moore, 1916). Initial excavations took place in 1915, though the majority of individuals at the Indian Knoll site were excavated between 1939 and 1941 (Webb, 1946). Of the 1234 total burials excavated from the Indian Knoll site, Kelley (1980) analyzed 813 individuals comprised of 463 adults,

(represented by males and females equally) and 345 subadults. Burial positions were primarily full-flexed, with the exception of few “unusual” burials lying partially flexed or supine, and placed in confining “round graves” (Webb, 1946). Preferential interment practices were evident based on the inclusion of grave goods – more adult males and subadults were associated with funerary objects than were females (Rothschild, 1979).

The results from the bioarchaeological studies conducted by Kelley (1980) and Cassidy (1984) indicate that the Archaic individuals at Indian Knoll suffered higher frequencies of interpersonal violence (males more than females; Kelley, 1980), osteoporosis, rickets (likely due to low calcium intake), and osteoarthritis in the spine than those seen in the comparable populations (Cassidy, 1984; Kelley, 1980). Furthermore, it was found that the individuals excavated from Indian Knoll exhibited severe tooth wear (caused by a high grit diet) and subsequent increased risk for abscess formation, often resulting in ante-mortem tooth loss (AMTL); there was, however, only a 10% frequency of dental caries (Kelley, 1980) found within this population due to a diet low in carbohydrates as well as a highly abrasive diet that may have worn away dental caries manifesting in the tooth enamel (Larsen, 1997).

Bluegrass (12W162)

Excavated between 1982 and 1988, the Bluegrass site dates to the late Middle Archaic with a long, multi-seasonal occupation period (6200–5000 B.P.) and was home to a foraging subsistence strategy group with a political system that allowed for achievable status. The site is located in southeast Indiana along

the Bluegrass Creek and twenty miles from the Ohio River without substantial rivers or stable wetlands nearby (Anslinger, 1988; Stafford, Richards, & Anslinger, 2000). The skeletal series was represented by males ($n = 22$) and females ($n = 15$) of all ages ($N = 82$) and burial positions were in extended, semi-flexed, and tightly flexed at many different orientations. Adult males received the most grave goods; utilitarian objects were found with individuals that may have been most useful and decorative objects were found with associated with individuals of all ages and both sexes (Mayes, 1997).

Bioarchaeological analysis conducted by Mayes (1997) showed the Bluegrass population to have access to adequate resources and limited occurrences of disease, as indicated by low frequencies of bone pathologies and dental indicators of stress. Infectious lesions of unknown etiology were found in two of the 52 observable individuals. Among the 59 crania examined, two mid-adult males exhibited signs of healed PH. Few individuals (5/64) of observable condition were found to have episodes of ameloblastic disruption (i.e., LEH); there were no differences between males and females and all were young adult in age. Additionally, dental health examinations of the individuals at Bluegrass showed that all individuals over the age of ten had severe dental attrition that progressed markedly with age resulting in dentin exposure by 20 years of age. As expected due to high attrition rates and a diet low in carbohydrates, there were low frequencies of dental caries (6%) found within this sample (Mayes, 1997).

Carrier Mills (Sa-87)

Comprised of three sites (Sa-86, Sa-87, and Sa-88), the Carrier Mills Archaeological District is a multicomponent site situated on low ridges that overlook swamps, a Pleistocene lake, and several shallow lakes in St. Louis, Missouri. Excavated in 1978 and 1979, Carrier Mills yielded 154 individuals in area A at site Sa-87 (Black Earth site) associated with Middle Archaic culture. A burial preference for west orientation (36%), whereas all others were interred at varying cardinal directions and burial positions were either flexed or extended. Of 124 of the burials, 27% were associated with grave goods; however, there was no significant difference in distribution found based on orientation or age. Additionally, the type of grave goods associated with individuals did not significantly vary, although males were interred with a wider variety of goods and were associated with procurement of resources (Bassett, 1982).

Skeletal analysis at Carrier Mills suggests this group to have low frequencies of pathologies and may have had adequate access to resources. The average height of males was 166.6 cm ($n = 46$); females were, on average, 158 cm ($n = 31$) tall. Fifteen percent ($n = 23$) had one or more fractures, although this may have represented the entire sample which also included individuals who belonged to the Woodland culture. Arthritic changes were found in nearly all of the adult individuals who were 35 years of age and older and no significant difference in frequency was found between the sexes. When considering dental pathologies, it was stated that high frequencies of abscesses, low frequencies of carious lesions, and very few cases of LEH were found in this sample. Lastly,

bone resorption of the vertebral column due to infection was found in eleven individuals (Bassett, 1982).

Elizabeth (11Pk512)

Situated on the western bluff overlooking the Illinois River in Pike County, Illinois, the Elizabeth site is a multicomponent site comprised of Archaic, Middle Woodland, and Late Woodland cultures. Excavations produced 47 observable adult Archaic individuals: 20 males, 16 females, and 11 of indeterminate sex (Frankenberg et al., 1988).

Paleopathological examinations showed that 11% of Archaic adults (1 male, 1 female, 3 of indeterminate sex) exhibited arthritis, 9% (2 males, 2 females) had periostotic lesions, and no individuals suffered from a traumatic lesion that were not associated with additional pathologies. Conversely, two females (4%) had arthritis associated with trauma, three males (6%) had arthritis associated with periostitis, and one male (2%) had periostitis associated with arthritis (Frankenberg et al., 1988).

Additional Sites

Although not comprehensively analyzed and comprised of small sample sizes, there have been a limited number of additional studies on Archaic populations, and their results will be used for further comparison in the interpretation of the findings from of Oak View Landing.

The Oak View Landing Site (40DR1)

The Oak View Landing site is located in Decatur County, Tennessee, along the west bank of the Tennessee River. In 1940, the site was first identified

by the University of Tennessee and “was reported to have ‘a great amount of pure mussel shell,’ projectile points, celts, and chips...[i]t was only within the last fifteen years that skeletal material began to show up in plowing [and] show on the surface” (Burroughs, 1941, p. 2). Subsequently, the Tennessee Valley Authority purchased the property, and under the direction of Charles H. Nash, began excavations in 1941. At that time, the site had been used for cultivation since 1870; however, the number of years of cultivation within that timeframe is unknown. At around the turn of the 20th century, the riverbank was cleared and plowed to build a house and warehouse, as well as the installation of a well. Six years after construction, the house was demolished and the well was filled in (Burroughs, 1941).

The site is located about 100 yards from the river on a low ridge framed by drainage sloughs cross-cutting the levee allowing flood water to drain back to the Tennessee River (Burroughs, 1941). The highest knoll at this location was the site of occupation. It appeared that the greatest concentrations of cultural material were found “north and east of the highest point of the knoll” (Burroughs, 1941, p. 3).

Three-foot wide trenches dug in the area of high concentrations revealed a plow zone and six sub-plow strata. Oak View Landing was found to be a multicomponent site including Archaic and Early and Late Woodland occupations. Although evidence of Woodland culture was found at the site, it appears that the duration of occupation was short. Sub-plow strata indicated that Archaic people had a long occupation period represented by Stratum I and

shorter occupations represented by Strata III and V; Strata II, IV, and VI appear to be periods of no occupation with intrusive cultural evidence (Burroughs, 1941).

Pottery sherds were found in the plow zone and were thus associated with the Woodland cultures; no pottery was found in the sub-plow strata. A total of 44 pits were identified at the site; the majority ($n = 25$) were found in Stratum I, and most of these were refuse pits containing faunal remains, shell, and artifacts. The remaining pits were fire and burial pits. According to the field report, seventy-three of the 81 burials were located in Stratum I, six were located in the plow zone, and two were found intrusively from Stratum III, most dated to the Archaic (with the exception of several Woodland burials). Individuals were interred both with and without grave goods, which were usually made of antler or bone, as both primary and secondary inclusions, and were placed in different orientations and flexations, including “ball” flexations (Burroughs, 1941, p. 12). Unfortunately, this study is limited due to lack of information as it pertains to refuse pits in the site reports from Oak View Landing. Additionally, excavations were limited to a restricted area and surrounding areas were not explored, further limiting the analysis and interpretation of this site.

In summary, the Archaic culture emerged during a time of climate change, which resulted in flora and fauna changes over the Southeastern United States (Anderson et al., 1996). In order to adapt, the Early Archaic people made expedient stone tools with local raw materials and residential mobility increased though they practiced a logistical settlement pattern, whereas by the Late Archaic, tools became less expedient and were made from nonlocal raw material;

additionally, there was an increase in logistical mobility (Amick & Carr, 1996). Food getting strategies and processing of resources became more efficient with innovated items such as nutting stones, atlatl weights, and grooved axes (Sassaman, 1996). These hunter-gathers exploited resources such as fruits, nuts, weedy annuals, deer, and aquatic resources (e.g., Geremillion, 1996; Styles & Klippel, 1996). Because Archaic groups were egalitarian, members had equal access to resources resulting in similar intake of nutrition and thus similar levels of health (Flanagan, 1989). Moreover, due to small group size, high mobility, and foraging subsistence strategies, infectious disease could not thrive, as dense, sedentary populations are favorable conditions for these pathogens (Larsen, 1997).

Health Indicators

Dietary Indicators

Evaluation of the diet of prehistoric populations is often used to understand subsistence strategies and how those strategies influence the overall health of a population. These indicators are argued to reflect nutritional inadequacies and types of foods being consumed.

Short stature has been well documented in the literature, both in living and past populations, as an indication of poor nutrition during growth and development, especially in regard to the consumption of protein (Bogin, 1988). Individuals, who during childhood did not have adequate protein in their diet, did not reach their “genetic growth potential” in adulthood (Larsen, 1997, p. 14).

Thus, the stature of individuals within a group may reflect their access to nutritional resources such as protein.

Dental caries are often used to reconstruct and interpret the diets of past populations, especially when discussing the transition from hunter-gatherer to agricultural subsistence strategies (e.g., Cassidy, 1984; Kelley, 1980). A diet rich in carbohydrates, a starchy substance that attracts and feeds bacteria such as *Lactobacillus acidophilus*, results in the demineralization of dental tissue from the acidic by-product of these bacteria. In advanced stages of this disease process, it is possible that the root becomes infected via the carious lesion resulting in an abscess and subsequent tooth loss (Larsen, 1997).

Research on the frequency of dental caries in hunter-gatherer groups, including Archaic populations, suggests that these populations had a low prevalence of carious lesions and thus a diet low in carbohydrates (Cassidy, 1984; Kelley, 1980). Additional studies suggest that in conjunction with a diet low in carbohydrate rich foods, an abrasive diet that wears down the cusps, thereby reducing crevices where bacteria concentrate, also results in low prevalence of carious lesions (Larsen, 1997). Furthermore, according to Lanfranco and Eggers (2010), the location of carious lesions may help to reconstruct the diets of past populations. The micro-flora found in the occlusal cups tend to be nourished by saliva and the foods eaten whereas the micro-flora found on the smooth surfaces of the tooth thrive on proteins (Lanfranco & Eggers, 2010). Additionally, the dental plaque also differs based on location; it is more alkaline in gingival sulci and more acidic interproximally and within tooth crevices; thus, based on the

locations of carious lesions, researchers can tease apart the cariogenic nature of past diets (i.e., the more cariogenic the diet, the higher the rate of extra-occlusal dental caries will be observed; Lanfranco & Eggers, 2010).

As mentioned above, abrasive diets cause the occlusal surface of the tooth to wear down from mastication. “Abrasion is caused by contact between the tooth and the food or other solid exogenous materials, especially as food is forced over occlusal surfaces” (Larsen, 1997, p. 247). The first mandibular molar has been shown to have consistency in the type and angle of wear based on subsistence strategies; hunter-gathers have flatter, lower angles of wear compared to agriculturalists (Larsen, 1997). Research in all regions of the United States suggests that Archaic populations exhibit extensive wear of the occlusal surface (Janetski et al., 1992; Shearin, Loveland, Parr, & Sack, 1996; Wentz & Gifford, 2007).

Non-Specific Stress Indicators

Commonly used dental and skeletal lesions, such as LEH, PH, and CO, are indicators for stressful life events; these events include periods of dietary constraints and/or bouts of illness.

During the dental growth and development of an individual, tooth formation begins with the ameloblastic production of enamel and proceeds from the cusp uniformly down to the cementoenamel junction (CEJ) and is subject to environmental stressors (e.g., poor nutrition, disease). If an individual experiences one or multiple environmental stressor/s during the time of tooth formation, macrodefects may appear in the enamel as a sign of metabolic

disruption (Goodman & Rose, 1990; Smith, 1991). These defects manifest as furrows or pits of varying sizes and the distance from the CEJ can be measured to estimate the age at which the individual experienced stress (Buikstra & Ubelaker, 1994; Larsen, 1997). These measurements provide an estimated age for these developmental defects and may have implications for when, during growth and development, these individuals experienced a traumatic health event (Goodman & Rose, 1990).

Moreover, an often-debated indication of health and diet is the identification and analysis of PH and CO as a result of iron deficiency. That is, previous research suggested that the gut has been found to decrease iron absorption during infection because many pathogens feed on iron (Stuart-Macadam, 1992). Other factors affecting iron deficiency include the consumption of a diet low in iron, dense living conditions, and prolonged nursing (El-Najjar, Ryan, Turner, & Lozoff, 1976; Walker, 1985). Recent research, however, suggests that the cortical table expansion found in PH and CO is caused by vitamin B₁₂ deficiency in the diet or a parasitic infection that intervenes in the absorption of this vitamin. Furthermore, evidence suggests that CO may not be as closely linked to PH as has long been accepted, but may be caused by the co-occurrence of vitamins B₁₂ and C deficiencies (Walker, Bathurst, Richman, Gjerdrum, & Andrushko, 2009).

Infection

A commonly reported lesion in paleopathology is periostitis, or new bone formation as a disease process. Inflammation from infection or trauma stimulates

the deposition of bone where the periosteum is lifted away from the bone by a haematoma; usually the long bones are affected, especially the tibiae (Mann & Hunt, 2005; Weston, 2011). When active, this type of bony reaction is characterized as discolored, pitted, and striated woven bone, and has defined margins that resemble tree bark attached to the outer surface of the cortical bone (Ortner, 2008). Overall smoothing and roundness occurs as the lesions heal. They exhibit reduced pitting and the margins are less distinct and blend in with surrounding cortical bone (Mann & Hunt, 2005).

In addition to periostitis, osteomyelitis is an infection resulting in osseous lesions that is often considered when investigating the health of past populations. Osteomyelitis is the infection of the marrow cavity of long bones and may be caused by pyogenic bacteria (e.g., *Streptococcus aureus*, salmonella). This form of infection commonly affects the proximal and distal portions of large long bones, though any bone may become infected. Osteomyelitis manifests as a proliferation of the periosteal and endosteal bone surfaces; the latter results in a narrowed medullary cavity (Larsen, 1997). Cloacae are commonly formed to drain the pus from the infection or sequestrum may result as necrotic bone separates from normal bone (Steinbock, 1976).

Temporal trends of periostitis and osteomyelitis demonstrate that agriculturalists have greater frequencies than hunter-gatherers due to an increase in population density, allowing for infectious disease to thrive, and a decrease in the quality of nutrition as agriculturalists become dependent on food staples (Larsen, 1997).

Activity Markers

According to Lovell (1997), traumatic injuries should be grouped into two categories based on their characteristics – fractures and dislocations – to avoid grouping by manner or intent. A fracture is “any break in the continuity of a bone,” and a dislocation is “the displacement of one or more bones at a joint” (Lovell, 1997, p. 140). Warfare (Lambert, 1997), accidents (Ortner & Putschar, 1985), cultural practices (Walker, 1997), and pathological fractures (Fayad et al., 2005) are causative factors for the manifestation of traumatic injury.

DJD, osteophytosis, and osteoarthritis, affect the margins and surfaces of articulating ends of osseous elements (Buikstra & Ubelaker, 1994). These changes manifest under the same etiology and pathogenesis. Mechanical stress placed on the joints will affect those articulations over time and may result in lipping, osteophytes, and in extreme cases, eburnation at those locations (Larsen, 1997).

Mortuary Practices

The study of mortuary practices within a population can provide important information for the analysis of social behavior (Larsen, 1997). It is assumed that the treatment of an individual in death should reflect how they were perceived during life, which in turn should give an indication of the social organization (e.g., egalitarian, stratified) of that population (Mires, 1991).

Aspects of how groups treat their members in death include the position of the burials (Milner & Jefferies, 1998) and the inclusion of grave goods (Janetski et al., 1992; Milner & Jefferies, 1998).

The Archaic culture began to appear in response to climatic changes during the mid-Holocene. Changes in the landscape and resources forced groups in the Southeastern United States to adapt by way of technology, resource exploitation, settlement patterns, and social organization. In turn, these adaptations have implications for health patterns seen in Archaic populations. Studies conducted on Southeastern populations, such as those excavated from Indian Knoll (Kelley, 1980), Bluegrass (Mayes, 1997), and Carrier Mills (Bassett, 1982), indicate overall robust health when considering access to resources, however, the active lifestyle of hunter-gatherers generally resulted in mechanical wear and traumatic lesions to the skeleton. Further, how these groups treated their members in death may have implications for social structure.

CHAPTER III

MATERIALS AND METHODS

The Oak View Landing skeletal series is currently curated at the McClung Museum of Natural History and Culture at the University of Tennessee-Knoxville. The Curator of Archaeology, Dr. Lynne Sullivan, provided a complete inventory, including sex and age assessments when possible. For this study, cranial and postcranial elements of all complete and partial Archaic adult individuals ($N = 50$) were comprehensively examined macroscopically for health markers as described below. Standard measurements were taken when applicable with the use of sliding and spreading calipers and an osteometric board (Buikstra & Ubelaker, 1994). Digital photographs were taken with a Nikon Coolpix camera to document observations. Furthermore, data from written records providing site descriptions, mortuary practices, and grave inclusions were used in this study to assist with the analysis of results. Collected data were analyzed using chi-square testing and values were considered statistically significant at $p \leq 0.05$. Findings from the Oak View Landing site were also compared with findings from other foraging groups.

Indicators of Dietary Health

Evaluation of the diet of prehistoric populations is often used to understand subsistence strategies and how those strategies influence the overall health of a population. For this study, three dietary indicators were examined: stature, dental caries, and dental wear. These indicators are argued to reflect nutritional inadequacies and types of foods being consumed.

Measurements using *Standards* (Buikstra & Ubelaker, 1994) were taken of all complete long bones (e.g., femur, tibia, humerus), and regression formulae developed by Sciulli and Giesen (1993) were used to estimate the height of these Archaic individuals. The reconstructed heights were then plotted and compared to values seen in contemporary populations in order to understand the growth patterns at Oak View Landing.

For this study, sets of adult dentition were observed for carious lesions and AMTL. Teeth samples were found *in situ* within the dental arcade, loose but could easily be placed in the dental arcade, or loose and unassociated with an individual but similar in color, size, and wear and thus were grouped together as a set of dentition. All sets of teeth were examined macroscopically for evidence of carious lesions. All observable maxillary and mandibular alveolar bone was examined macroscopically for evidence of healing or completely healed tooth sockets due to AMTL. Scoring was as follows:

- (-) = unobservable
- 1 = tooth, no lesion
- 2 = <1/4 of the tooth affected
- 3 = 1/4-1/2 of the tooth affected
- 4 = 1/2-3/4 of the tooth affected
- 5 = crown completely decayed, roots still present
- 6 = AMTL

Where teeth exhibited multiple carious lesions, they were scored as a single affected tooth. In addition to scoring the presence or absence of carious

lesions and amount of tooth affected, occlusal and/or extra-occlusal decay was also recorded. The percent of individuals with carious lesions within the population as well as the percent of teeth affected both aggregated and by class (i.e., molar, incisor, etc.), were calculated.

The dentition of adults was examined macroscopically and scored for wear using Smith's (1984) for premolars as cited in *Standards* (Buikstra & Ubelaker, 1994). Dental wear patterns of this population were analyzed based on age and sex to explore differential demographic dietary trends; furthermore, angle of wear was used to determine the link between masticatory activity and diet. Results were then compared with populations of comparable and differing environments to understand the manifestations of tooth wear based on available resources.

Non-Specific Stress Indicators

To examine this population for non-specific evidence of stress during childhood, LEH were recorded. Hypoplasias of the maxillary central and lateral incisors and mandibular canines were examined; when present, the distance from the CEJ to the center of the defect was measured using sliding calipers (Buikstra & Ubelaker, 1994). Age of onset was determined with the use of the mineralization diagram created by Goodman, Armelagos, and Rose (1980). This data set was used to interpret patterns of dental defects as they manifested in the inhabitants of Oak View Landing, and how they compared to other foraging groups.

PH and CO were also investigated as additional evidence to indicate non-specific pressures experienced by this Archaic group. Individuals in this skeletal series with at least 50% of the cranial vault, including orbits, were scored macroscopically for the presence or absence of porotic bony lesions. When lesions were present, the degree of porosity, location of lesions, thickness of the cancellous hypertrophy, and whether the lesion was healed or active were scored using the criteria described in *Standards* (Buikstra & Ubelaker, 1994). Results were then demographically analyzed within this sample then further compared with additional foraging populations.

Infectious Lesions

Because periostitis and osteomyelitis may affect axial and appendicular skeletal elements, all osseous material was examined macroscopically for healed and active lesions, structures (involucrum and sequestrum), cortex perforation (cloacae), as well as the extent to which the element was affected (Buikstra & Ubelaker, 1994). Recorded data were analyzed to determine the percent of individuals affected. Additionally, location of infection was analyzed to determine any patterns based on age and/or sex as it relates to the level of health of this population, as well as how they fared in comparison to other hunter-gatherers.

Activity Markers

Cranial and postcranial elements were macroscopically examined for healed and perimortem fractures (Berryman & Haun, 1996). Age and sex, location of fracture, type of injury (i.e., blunt, sharp, accidental, intentional), and number of elements affected were considered during analysis.

Because Archaic populations are generally characterized as living a highly mobile lifestyle, this study assessed the prevalence of DJD at Oak View Landing. All observable articulating surfaces where more than 50% of the surface was observable, including axial and appendicular elements, were examined macroscopically and scored on the presence or absence of bony changes (osteophytes, lipping, surface porosity, eburnation). When DJD was present, the degree of change and the area of surface affected were scored using *Standards* (Buikstra & Ubelaker, 1994). The percent of individuals affected, number of articulating surfaces suffered by each individual, and location of DJD were calculated and compared demographically and extra-locally with additional Archaic populations.

Mortuary Practices

Mortuary data was provided in a database received from the McClung Museum and included the position of the burials and associated grave goods at this site. A burial report was available with the demographic distribution of burial locations at the Oak View Landing site. The report was used to tease apart any differential mortuary treatment with regards to age, sex, and presence of pathology.

Health patterns found at the Oak View Landing site help to understand the lifestyle of this Archaic population. Dietary variables as presented in the osseous material, non-specific stress indicators, signs of infection, activity markers, and mortuary practices were assessed to determine access to resources within the landscape they inhabited, as well as the social structure by which this group

operated. The addition of the Oak View Landing skeletal sample, as it compares with other Archaic sites, further adds to the understanding of prehistoric foraging peoples.

CHAPTER IV

RESULTS AND DISCUSSION

Ninety-three burials in total were excavated from the Oak View Landing site. Several adults were represented by poorly preserved osseous elements and were not used in this research; however, 50 adult Archaic individuals were sufficiently preserved for the examination of various health indicators. Burial reports were used to examine the association between mortuary practices and health. Patterns were then compared to those seen at contemporaneous sites of both similar and contrasting environments.

Demographic Analysis

Demographic data of the adult individuals was taken from inventory records held at the McClung Museum (Table 1). Sex was determined for 34 individuals (18 males, 16 females), while age was estimated for 21 adults (8 young adults, 2 young-middle adults, 3 middle adults, 8 middle-old adults).

Table 1

Age and Sex Distribution for the Oak View Landing Skeletal Series

	Young Adult	Young-Middle Adult	Middle Adult	Middle-Old Adult	Unknown Age	Total
Male	3	1	1	3	10	18
Female	3	1	2	4	6	16
Unknown Sex	2	0	0	1	13	16
Total	8	2	3	8	29	50

Dietary Analysis

The long bones were measured, and the dentitions were examined from the Oak View Landing site for several commonly observed indicators. The results were analyzed for sex differences within the population to see what they might reveal about dietary practices. They were also compared with patterns seen in other contemporary populations to explore social and environmental implications.

Stature

Mean stature. Stature was estimated for 26% ($n = 13$) of the adults examined, nine males and four females (Figures 2 and 3, respectively). Individuals of indeterminate sex were not included in the analysis of stature. Height was determined with the regression formulae created by Sciulli and Giesen (1993) using the measurements taken from complete femora, tibiae, or humeri. The mean height for males at Oak View Landing was 160.5 cm (SD = 8.78); the tallest male was 167.6 cm and the shortest was 138.8 cm ($n = 9$). When excluding the shortest male, who had no apparent pathology to explain his shortness in stature and was considered an outlier, the mean height for males was 163.2 cm (SD = 3.51) and the shortest male was 158.8 cm. The mean height for females was 156.1 cm (SD = 2.53), the tallest being 159.6 cm and the shortest being 153.5 cm ($n = 4$).

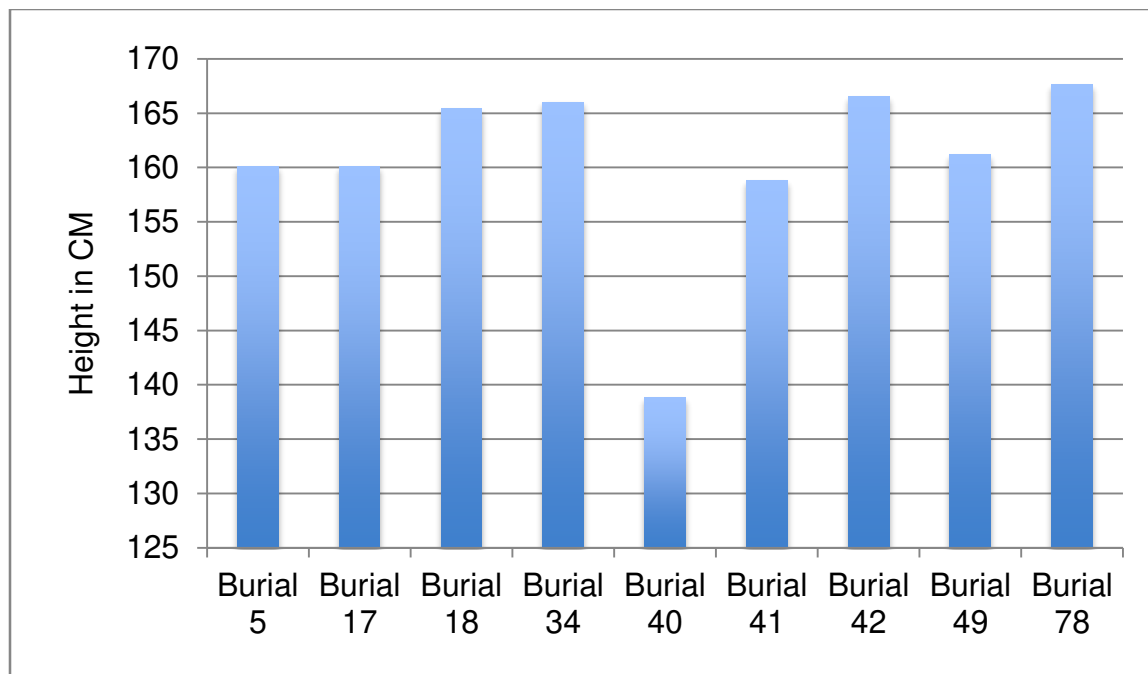


Figure 2. Stature estimates for males by burial at Oak View Landing.

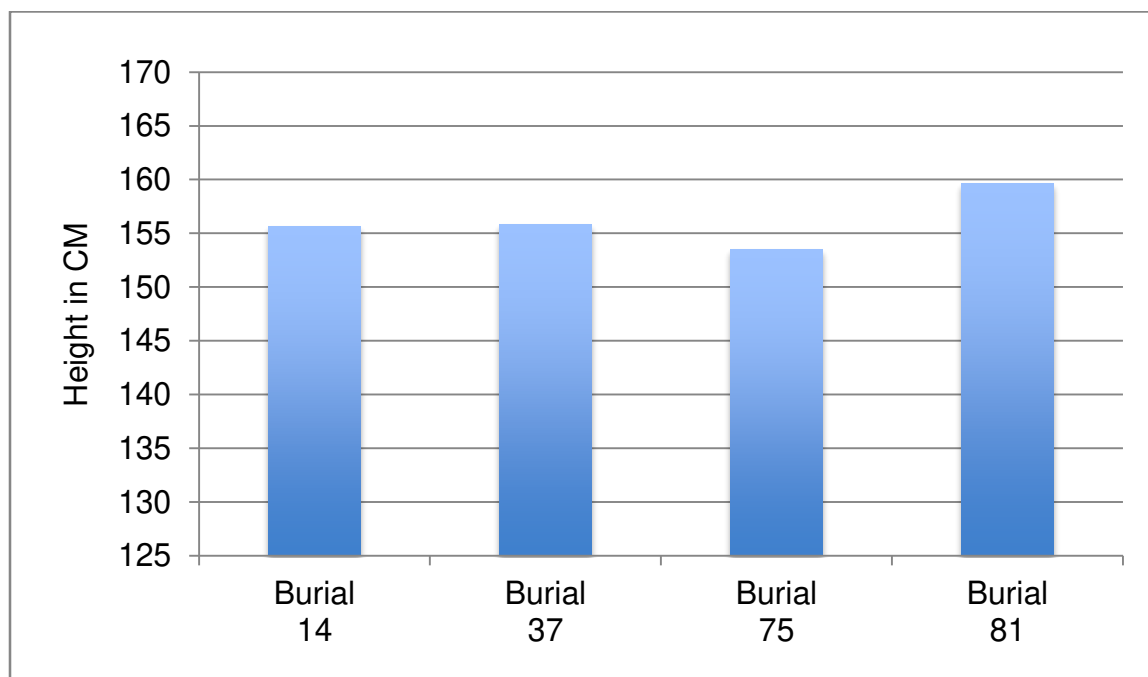


Figure 3. Stature estimates for females by burial at Oak View Landing.

The average male height at Oak View Landing (163.2 cm) falls within the range of mean height of other Southeastern Archaic groups (Figure 4). When

compared to sites located further north but of fairly similar environments, the mean stature of males at Oak View Landing was somewhat shorter than that found in the Bluegrass population (164.9 cm; Mayes, 1997) and the Great Lakes region (166.0 cm; Sciulli, Pacheco, & Janini, 1991). As seen in Figure 4, males at Oak View Landing were taller than those found in the Channel Islands of California (157.4 cm; Kerr, 2004) and Nunivak Island (158.1 cm; Yeats, 2011) in the circumpolar region.

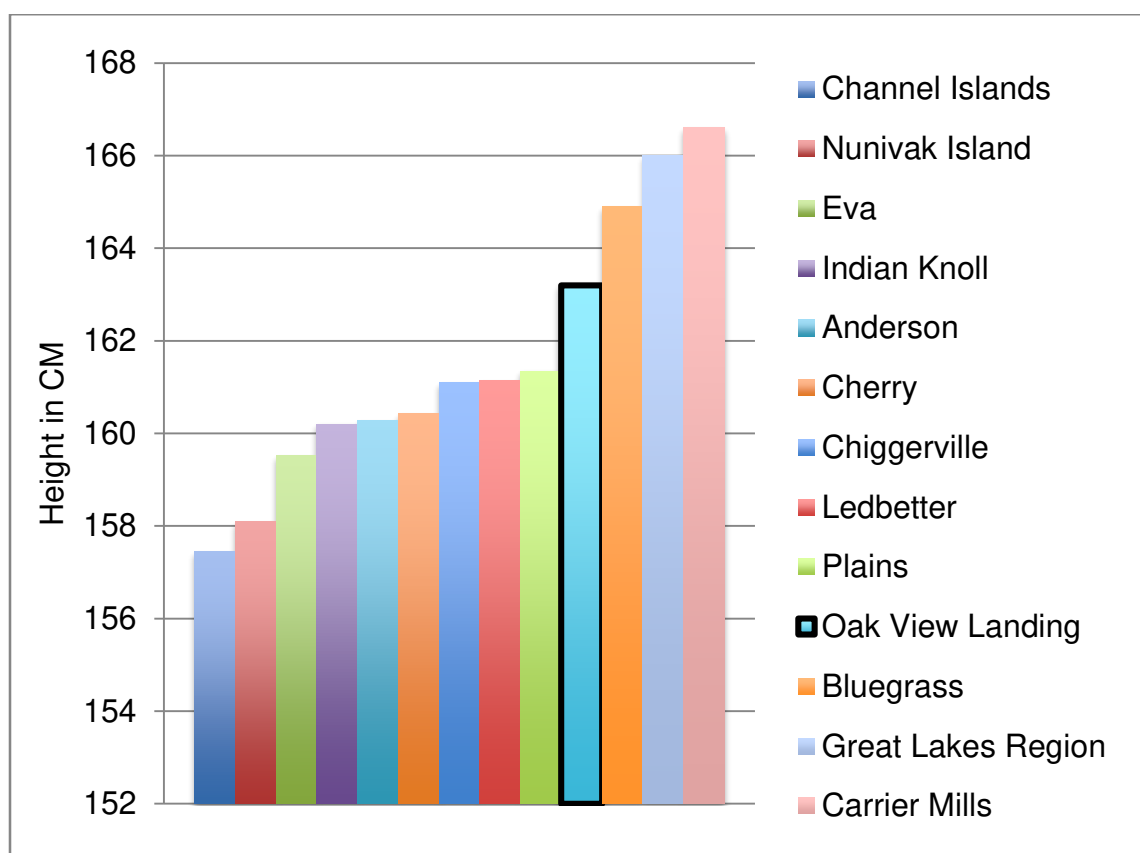


Figure 4. Comparison of mean stature of males at Oak View Landing and hunter-gatherer populations. Bordered graphic represents the Oak View Landing site.

The females at Oak View Landing were amongst the tallest of all groups examined and had an average height of 156.1 cm (Figure 5). Similar heights were found in areas such as the Great Lakes Region (159.1 cm; Boyd & Boyd,

1989) and the Bluegrass site (153.7 cm; Mayes, 1997). However, there was markedly shorter average female height in groups such as those at the Chiggerville (147.4 cm; Webb & Haag, 1939) and Channel Islands (148.4 cm; Kerr, 2004) sites. Thus, the stature of males and females at Oak View Landing was greater than most of the comparable hunter-gatherer populations used in this study.

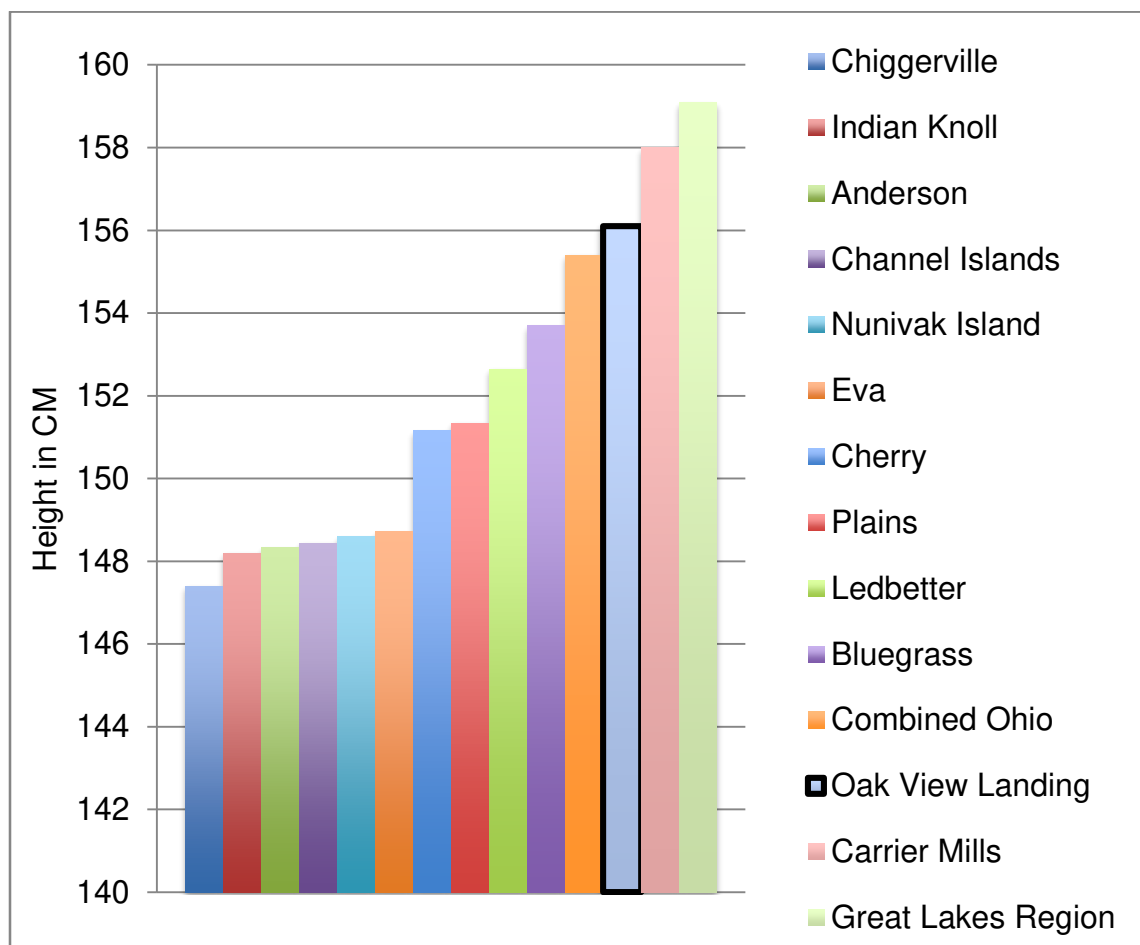


Figure 5. Comparison of mean stature of females at Oak View Landing and hunter-gatherer populations. Bordered graphic represents the Oak View Landing site.

Sexual dimorphism. As shown in Figure 6, the degree of sexual dimorphism found at Oak View Landing (1.05) is among the smallest when

compared to other hunter-gatherer groups; the greatest level at 1.09 was found at the Chiggerville site (Webb & Haag, 1939) and the combined Ohio groups (Sciulli et al., 1991). Ratios to the one seen at Oak View Landing were observed in the Great Lakes Region (1.04; Sciulli et al., 1991) and Carrier Mills (1.05; Bassett, 1982). Groups of differing environmental conditions, such as the Channel Islands (1.06; Kerr, 2004) and Plains (1.07; Wescott, 2008), fell within the range of the level of sexual dimorphism of Southeastern populations.

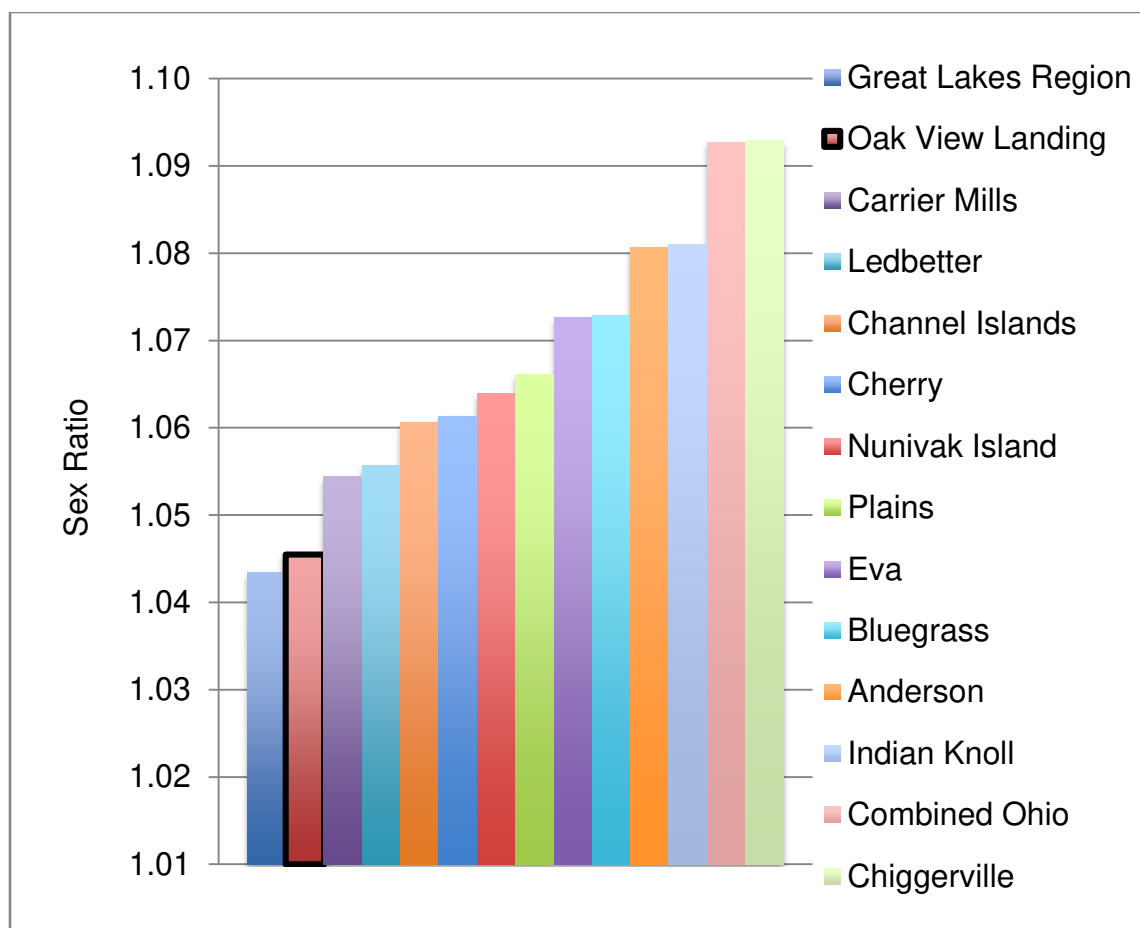


Figure 6. Comparison of degree of sexual dimorphism at Oak View Landing and hunter-gatherer populations as a male-to-female ratio. Bordered graphic represents the Oak View Landing site.

Dental Caries

Overall frequency in population. Among the 37 observable adult dentitions, 28 (76%) were affected with at least one carious lesion (Table 2). Based on total number of teeth, 15% (85/548) of teeth had caries. The posterior teeth were more frequently affected than were the anterior teeth, especially in females ($p = .00$). Although there was a high prevalence of individuals with carious lesions, none were severe and were all scored as less than one-quarter of the tooth decayed. The prevalence of males (82%) with carious lesions was slightly higher than females (73%); dental caries were found in 67% of adults of indeterminate sex. A higher percentage of females (64%) than males (47%) had more than one tooth affected. However, these findings were not considered statistically significant ($p = .54$ and $p = .39$, respectively).

Table 2

Frequencies and Statistical Significance Values for Dental Caries at Oak View Landing by Age and Sex

	Number affected out of (N)	%	<i>p</i>
Total teeth with carious lesions	85 (548)	15.5	
Individuals with carious lesions	28 (37)	75.7	
Males	14 (17)	82.4	
Females	8 (11)	72.7	
Males vs. Females			.54
Indeterminate sex	6 (9)	66.7	
More than one tooth affected	19 (37)	51.4	
Males	8 (17)	47.1	

Table 2 (continued).

	Number affected out of (N)	%	<i>p</i>
Females	7 (11)	63.6	
Males vs. Females			
Indeterminate sex	4 (9)	44.4	.39
Total posterior teeth	75 (394)	19.0	
Males	27 (204)	13.2	
Females	36 (98)	36.7	
Males vs. Females			.00
Total anterior teeth	9 (154)	5.8	
Males	5 (93)	5.4	
Females	2 (28)	7.1	
Males vs. Females			.73
Total anterior maxillary teeth	7 (71)	9.9	
Males	4 (39)	10.3	
Females	2 (18)	11.1	
Males vs. Females			.92
Total posterior maxillary teeth	49 (183)	26.8	
Males	20 (96)	20.8	
Females	25 (49)	51.0	
Males vs. Females			.00
Total anterior mandibular teeth	2 (83)	2.4	
Males	1 (54)	1.9	
Females	0 (10)	0.0	
Males vs. Females			.66
Total posterior mandibular teeth	26 (211)	12.3	
Males	7 (108)	6.5	
Females	11 (49)	22.4	
Males vs. Females			.00

In comparison, caries frequencies were seen to be much lower at other Southeastern Archaic sites. Mayes (1997) found that 5/82 (6%) of individuals exhibited dental caries at the Bluegrass site. Of the 197 adult dentitions examined at Indian Knoll, 20 (10%) had carious lesions: 8/112 (7%) males and 12/85 (14%) females (Kelley, 1980).

Other regions also had lower frequencies of dental caries when compared to Oak View Landing. Winn (2012) recorded dental caries in 2% (4/188) of total teeth observed in a Great Plains Archaic population; all caries were found in the posterior teeth and there was no difference in frequency based on sex. Additional studies of hunter-gatherer groups in Fourche Maline, Oklahoma (Powell, 1985), Patagonia, Argentina (Bernal, Novellino, Gonzalez, & Perez, 2007), Windover, Florida (Wentz, 2006), Bering Sinkhole in Texas (Bement, 1991), and the Santa Barbara Channel Islands, California (Walker & Erlandson, 1986) indicate lower frequencies of teeth with carious lesions at all these sites (Table 3).

Table 3

Percent of Individuals and Total Teeth with One or More Carious Lesion in Oak View Landing and Comparative Hunter-Gather Populations

Site	% of total number of adult dentitions affected	% of total teeth affected
Oak View Landing	76.0	15.5
Bluegrass	6.0	
Indian Knoll	10.2	
Great Plains		2.0
Bering Sinkhole	63.0	

Table 3 (continued).

Site	% of total number of adult dentitions affected	% of total teeth affected
Fourche Maline		0.1
Patagonia		3.3
Windover		5.2
Santa Barbara		5.6

Caries location. Analysis showed that 20 (54%) of the observable dentitions had an extra-occlusal carious lesion, and 31 of the 38 (82%) teeth with extra-occlusal decay were along the CEJ, suggesting a carbohydrate-rich diet (Lanfranco & Eggers, 2010). When considering the number of individuals with caries, males (65%) were slightly more affected than females (46%), though this was not found to be statistically significant ($p = .31$). However, when considering the total number of teeth evaluated, females (14% of total teeth) had significantly more lesions than males (5% of total teeth; $p = .00$). Furthermore, the highest rate of extra-occlusal lesions was found in the posterior dentition of females (17%), and this value was statistically significant when compared with the rate found in males (5%; $p = .00$; Table 4).

Table 4

Frequencies and Statistical Significance Values for Extra-Occlusal Caries at Oak View Landing by Age and Sex

Extra-occlusal carious lesions	Number affected out of (N)	%	<i>p</i>
Total teeth observed	38 (548)	6.9	
Total teeth with lesion	38 (85)	44.7	
Carious lesion long CEJ	31 (38)	81.6	
Total individuals	20 (37)	54.1	
Males	11 (17)	64.7	
Females	5 (11)	45.5	
Males vs. Females			.31
Indeterminate	4 (9)	44.4	
Total teeth			
Males	14 (297)	4.7	
Females	18 (126)	14.3	
Males vs. Females			.00
Total posterior teeth	34 (394)	8.6	
Males	11 (204)	5.4	
Females	17 (98)	17.3	
Males vs. Females			.00
Anterior teeth	4 (154)	2.6	
Males	3 (93)	3.2	
Females	1 (28)	3.6	
Males vs. Females			.66

When considering the location of tooth decay in the comparative groups, both Mayes (1997) and Link (1999) state that all individuals scored for carious lesions at the Bluegrass and Lokomotiv sites, respectively, had lesions to the occlusal surface of the mandibular molars, whereas carious lesions recorded at

Oak View Landing were seen in both anterior and posterior dentition and the occlusal and extra-occlusal surfaces.

Ante-mortem tooth loss. Sixteen of the 37 (43%) individuals with observable alveolar bone had at least one tooth lost ante-mortem, eleven of whom had more than one AMTL (Table 5). AMTL was found more often in males (53%) than females (36%), and the percentage of males (35%) with more than one AMTL was greater than that seen in females (27%); however, neither of these differences was statically significant ($p = .39$ and $p = .65$, respectively). When considering the total number of sockets with AMTL at Oak View Landing, 7% (40/588) had a tooth lost ante-mortem. Furthermore, the posterior dentition (9%) was significantly more affected than anterior dentition (1%; $p = .00$), and the posterior dentition of males (8%) and females (9%) were equally affected.

Table 5

Ante-Mortem Tooth Loss Frequencies and Statistical Significance Values for Oak View Landing by Age and Sex

	Number affected out of (N)	%	p
Total sockets	40 (588)	6.8	
Males	21 (318)	6.6	
Females	10 (136)	7.4	
Males vs. Females			.78
Total individuals with AMTL	16 (37)	43.2	
Males	9 (17)	52.9	
Females	4 (11)	36.4	
Males vs. Females			.39
Indeterminate	3 (9)	33.3	

Table 5 (continued).

	Number affected out of (N)	%	<i>p</i>
More than one AMTL	11 (37)	29.7	
Males	6 (17)	35.3	
Females	3 (11)	27.3	
Males vs. Females			.65
Indeterminate	2 (9)	22.2	
Posterior teeth	29 (341)	8.5	
Males	19 (233)	8.2	
Females	10 (108)	9.3	
Males vs. Females			.73
Anterior teeth	2 (177)	1.1	
Males	2 (149)	1.3	
Females	0 (28)	0.0	
Males vs. Females			.54
Anterior vs. Posterior			.00

In comparing the rates of AMTL observed in other Southeastern populations, Mayes (1997) reports that six of the 82 (7%) individuals at the Bluegrass site were affected, four of whom had more than one tooth lost ante-mortem. In sites from other regions, Winn (2012) found a frequency of 5% of AMTL when looking at total tooth locations of a Plains Indians group, all of which involved the posterior dentition. Two percent of total tooth sockets had AMTL in the Texas coastal plains Archaic assemblage (Taylor, 2006). AMTL was found in less than 1% and 10% of total sockets observed at the Lokomotiv cemetery located along Lake Angara's outlet in Cis-Baikal, Siberia (Link, 1999) and Windover, a coastal site in east-central Florida (Wentz, 2006), respectively. Thus,

Oak View Landing had a higher frequency of AMTL than is seen in most hunter-gatherer groups.

Dental Wear

Every adult ($n = 36$) scored for dental attrition at Oak View Landing exhibited observable wear. Using the standards to score tooth wear of the premolar from Smith (1984), the mean score of dental attrition was 6.94. The pattern of lower wear plane angles characteristic of hunter-gatherer groups was seen and was positively correlated with age. With the exception of one individual of indeterminate sex and one male (6%), the majority of this group was between stages 6 and 8 of occlusal wear (94%; Smith, 1984). One-third of the population suffered severe wear, a score of 7 or 8, resulting in the loss of enamel beyond the CEJ and leaving fully exposed cores of dentin. When considering wear patterns by sex, males (71%) and females (80%) had similar frequencies of severe attrition with mean scores of 6.88 and 7.30, respectively.

The qualitative results for wear from Oak View Landing were similar to those found in other Southeastern hunter-gatherer groups. Mayes (1997) states that dentin exposure was observed in all individuals over 20 years of age at Bluegrass; however, the angle of wear on the molars seen at Bluegrass appeared to mirror that found in groups practicing agricultural subsistence. At the Indian Knoll site, Kelley (1980) observed “pulp exposure was not only an extremely common event, but it occurred unusually early in life—typically during the third and fourth decades” (p. 127).

Dental attrition in comparable skeletal series from differing environments was also found to be similar to those seen at Oak View Landing. Mean scores of attrition in the first premolar of an Archaic Plains population were 6.45 for males and 6.93 for females (Winn, 2012). When Middle and Late Archaic subgroups were collapsed, a Texas coastal plain group had an overall population mean score of 5.41 (Taylor, 2006). Berbesque (2010) found that the tooth wear in the Hadza, a hunter-gatherer population in Tanzania, reflected those of other foraging groups with an overall population mean score of 4.11. Thus, overall, Oak View Landing was typical of most hunter-gatherer groups in level of tooth wear.

Non-Specific Stress Indicators

Several non-specific stress markers were observed in the Oak View Landing skeletal series to see what information they might provide about overall health, intragroup analysis was conducted based on sex. Intergroup non-specific stress indices were then compared with those found at the Oak View Landing site.

Linear Enamel Hypoplasias

Overall frequency in population. Eight of the 23 (35%) observable dentitions in the Oak View Landing population had at least one tooth affected with LEH. Thirteen percent of these had more than one event (Table 6). In the Bluegrass population, Mayes (1997) found that 8% (5/64) of individuals observed had an enamel growth disruption, three of whom suffered multiple episodes. LEH was found in 38% (8/21) of Inuit, a coastal population found in the circumpolar

region of Alaska (Guatelli-Steinberg, Larsen, & Hutchinson, 2004). Twenty-seven percent of the population (13/48) was affected in the Lokomotiv site (Link, 1999).

Table 6

Frequencies and Statistical Significance Values for Linear Enamel Hypoplasias at Oak View Landing by Age and Sex

	Number affected out of (N)	%	<i>p</i>
Total individuals	8 (23)	34.8	
Males	6 (14)	42.9	
Females	1 (5)	20.0	
Males vs. Females			.36
Indeterminate	1 (4)	25.0	
Individuals with >1 episode on single tooth	3 (23)	13.0	
Males	2 (14)	14.3	
Females	0 (5)	0.0	
Males vs. Females			.37

At the Oak View Landing site, males (43%) were more frequently affected than were females (20%), though it was not found to be statistically significant ($p = .36$). There was also no significant difference between males and females at the Bluegrass (Mayes, 1997) and Lokomotiv (Link, 1999) sites.

Frequency by tooth type. Fifty percent of the maxillary incisors observed, one per individual were affected with LEH with a mean number of episodes of .50, and the average age of formation was between three and three and half years. Thirty-five percent of mandibular canines, one per individual, were affected with a mean number of episodes of .50 and an average age of formation at four and half years (Table 7).

Table 7

Frequencies and Age at Formation of Linear Enamel Hypoplasias at Oak View Landing by Tooth Type

	Number affected out of (N)	%	Mean Number of episodes	Average age at formation
Maxillary incisor	6 (12)	50.0	.50	3-3.5
Mandibular canine	7 (20)	35.0	.50	4.5

Porotic Hyperostosis and Cribra Orbitalia

Of the 43 observable adult crania examined from the Oak View Landing sample, none exhibited signs of metabolic disease manifested as PH and/or CO. These results are not surprising for a hunter-gatherer group and are similar in frequency to those seen at comparable sites. At the Bluegrass site, two (both adult males) of the 59 (3%) individuals were observed to have PH (Mayes, 1997), whereas no cases of PH/CO were found in adults at the Elizabeth (0/47; Frankenberg et al., 1988) and Carrier Mills (Bassett, 1982) sites. Wentz (2006), however, found 22% (13/58) of individuals affected with CO and 8% (5/62) affected with PH at the Windover site.

Infectious Lesions

The adult individuals excavated from the Oak View Landing site were examined for the manifestation and prevalence of non-specific infection as an indication of overall health. Sex differentiation and population comparisons were delineated to help formulate the relative health context of this population.

Results from this study suggest that the individuals interred at the Oak View Landing site displayed low levels of non-specific infection (i.e., periostitis and osteomyelitis).

Periostitis

Four out of 50 (8%) individuals had periosteal lesions of unknown etiology. Three of the individuals had a small, healed periosteal reaction on a single lower limb (two tibiae and one femur), while one young adult female exhibited severe, active lesions over nearly every appendicular and axial element observed, indicating a systemic infection. Of these four individuals, three were female and one was male; the sex difference was not found to be statistically significant ($p = .32$; Table 8).

In her study of the Bluegrass site, Mayes (1997) found that one adult female (1%) was affected with periosteal lesions to the sacrum and thoracic region of the spine and posited its possible etiology to be due to blastomycosis as tuberculosis would be unlikely in a hunter-gatherer group. Periostitis was found primarily on long bone shafts and endocranial surfaces at Indian Knoll with a total frequency of 2% (9/463) of individuals affected (Kelley, 1980). Seven percent (5/71) of observed tibia and 14% (11/77) of remaining elements at Windover exhibited periosteal lesions (Wentz, 2006).

Osteomyelitis

Only one individual, a mid-adult female (2% of total sample), from the Oak View Landing site showed signs of osteomyelitis (Table 8). Nearly every appendicular and axial element observed was affected, with the exception of the

sacrum. Similar frequencies were found at the Bluegrass and Indian Knoll sites. Mayes (1997) found no evidence of osteomyelitis at the Bluegrass site (0/82). Of the total 463 individuals observed at Indian Knoll, 18 (4%) were scored as exhibiting osteomyelitis. These lesions were “scattered in terms of skeletal location...ear, palate, lacrimal fossa, spine, long bone shafts, feet, and the pelvis” (Kelley, 1980, p. 141). Thus, patterns of infection at Oak View Landing are typical of hunter-gatherer groups.

Table 8

Frequencies and Statistical Significance Values for Periostitis and Osteomyelitis at Oak View Landing by Age and Sex

	Number affected out of (N)	%	<i>p</i>
Periostitis			
Total affected	4 (50)	8.0	
Femur	1 (45)	2.2	
Tibia	2 (41)	4.9	
Systemic	1 (50)	2.0	
Male	1 (18)	5.6	
Female	3 (16)	18.8	
Males vs. Females			.32
Indeterminate	0 (16)	0.0	
Osteomyelitis			
Total affected	1 (50)	2.0	
Systemic	1 (50)	2.0	
Male	0 (18)	0.0	
Female	1 (16)	6.3	
Male vs. Female			.29
Indeterminate	0 (16)	0.0	

Activity Markers

To assess the activity of the Oak View Landing skeletal series, cranial and postcranial elements, including all observable osseous articulations, were examined for traumatic injury and mechanical wear. Males and females were compared to determine any patterns based on sex. Further, results were compared with other hunter-gatherer populations to see how they fared with contemporaneous groups.

Trauma

Trauma was rather frequent within the Oak View Landing population, with fourteen of the 50 (28%) Archaic adults manifesting signs of cranial and postcranial trauma. Females (38%) were slightly more frequently affected than were males (33%); however, this difference was not found to be statistically significant ($p = .81$). All fractures were to the upper skeleton, including the radius, ulna, clavicle, and cranium. As seen in Table 9, many of the locations of traumatic lesions are indicative of interpersonal violence (e.g., parry fractures and small cranial depressions). Two individuals had more than one element with a healed fracture: one adult female had healed, bilateral fractures to the ulnae and one adult male had healed fractures to the skull and to the right radius and ulna.

Table 9

Frequencies and Statistical Significance Values for Trauma at Oak View Landing by Age and Sex

	Number affected out of (N)	%	<i>p</i>
Total individuals	14 (50)	28.0	
Males	6 (18)	33.3	
Females	6 (16)	37.5	
Males vs. Females			.81
Indeterminate	2 (16)	12.5	
Element affected			
Crania	8 (43)	18.6	
Radius	2 (39)	5.1	
Ulna	4 (40)	10.0	
Clavicle	1 (40)	2.5	
Individuals with >1 element affected	2 (50)	4.0	

The frequency of trauma found at the Oak View Landing site was higher than those found at the Bluegrass and Carrier Mills sites. Mayes (1997) reported evidence of trauma in two of the 82 (2%) individuals observed at the Bluegrass site. One female had healed fractures to the lower arm bones and one unprovenienced metacarpal had a traumatic injury. Fifteen percent (23/154) of the Carrier Mills population suffered cranial and postcranial fractures (Bassett, 1982). Similar to Oak View Landing, the frequency of trauma at Indian Knoll was found in 21% (99/463) of the population. However, sex differences at the Indian Knoll site differed from Oak View Landing: males (67/248, 27%) were almost two times more frequently affected than females (32/215, 15%). Kelley (1980) found

fractures along the entire skeleton, many of which were compression fractures (Figure 7). Interpersonal violence as the causative factor for traumatic lesions was found in 7% (31/463) of the total population and males (21/248, 8%) experienced interpersonal violence more frequently than did females (11/215, 5%). Evidence of aggression was found in the form of projectile points, depressed skull fractures, nasal and zygomatic fractures, scalping, and parry fractures (Kelley, 1980). The frequency of traumatic injury seen at Oak View Landing, especially in females, is not typically seen in Southeastern Archaic groups.

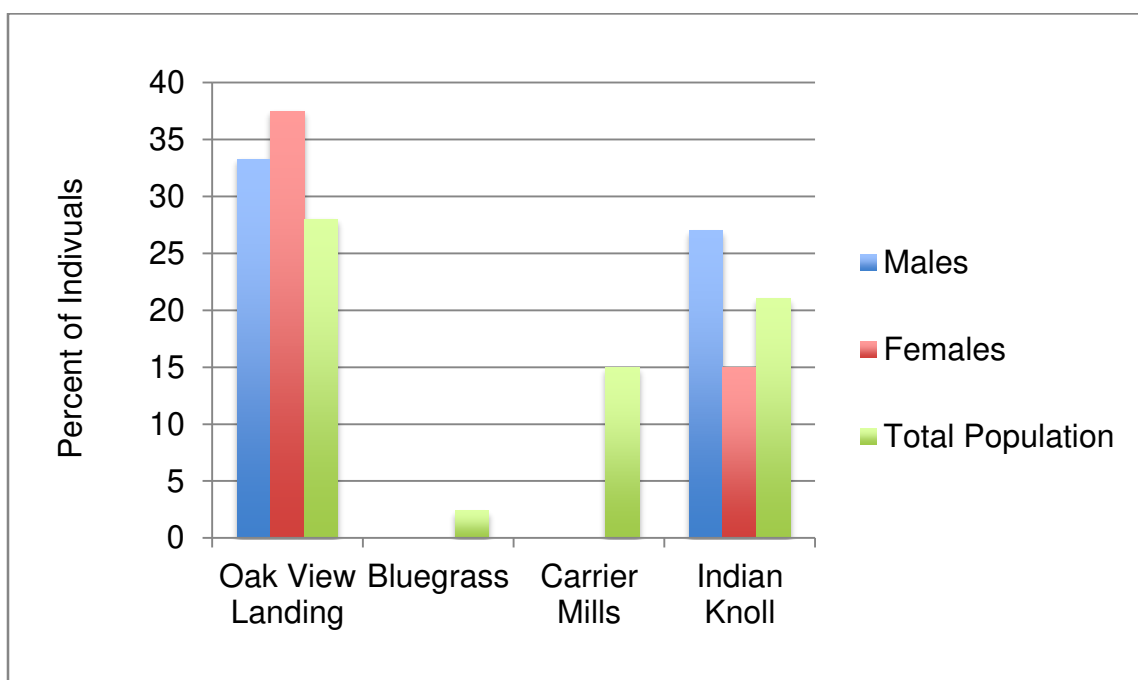


Figure 7. Overall percent of males, females, and total population with traumatic injury at Oak View Landing and comparative hunter-gatherer groups.

Degenerative Joint Disease

DJD was found in 40% (20/50) of the total population at the Oak View Landing site. All twenty of the adult individuals with DJD expressed it in the

vertebral column; of those, most were affected in the lumbar region (59%), and seven were affected in two or more regions (14%). Only one case of DJD to extraverterbral elements was observed - one adult female had DJD to the distal right ulna. Males (71%) were more frequently affected than females (39%; Table 10).

Table 10

Degenerative Joint Disease in the Oak View Landing Skeletal Series by Age and Sex

	Number affected out of (N)	%	<i>p</i>
Total affected	20 (50)	40.0	
Males	10 (14)	71.4	
Females	5 (13)	38.5	
Males vs. Females			.08
Indeterminate	4 (10)	40.0	
Lumbar vertebrae affected	10 (17)	58.8	
Males	5 (6)	83.3	
Females	4 (9)	44.4	
Males vs. Females			.13
Indeterminate	1 (2)	50.0	
Sacrum affected	5 (19)	26.3	
Males	2 (8)	25.0	
Females	3 (10)	30.0	
Males vs. Females			.81
Indeterminate	0 (1)	0.0	
Cervical vertebrae affected	12 (36)	33.3	
Males	7 (14)	50.0	
Females	1 (12)	8.3	
Males vs. Females			.02
Indeterminate	3 (10)	30.0	
Thoracic vertebrae affected	5 (23)	21.7	

Table 10 (continued).

	Number affected out of (N)	%	<i>p</i>
Males	5 (13)	38.5	
Females	0 (7)	0.0	
Males vs. Females			.06
Indeterminate	0 (3)	0.0	
>1 region affected	7 (50)	14.0	
Males	5 (14)	35.7	
Females	3 (13)	23.1	
Males vs. Females			.47
Indeterminate	0 (10)	0.0	
Extravertebral DJD			
Ulna	1 (39)	2.6	

With the exception of Indian Knoll, rates of DJD at Oak View Landing were somewhat high compared to those seen at contemporaneous sites. The condition was found in 24% (10/41) in the Bluegrass site population, and the spine, knee, hip, and clavicle were affected; these frequencies were lower than expected and were attributed to the “fragmentary nature of the...skeletal remains” (Mayes, 1997, p. 64). Eleven percent (5/47) of the individuals examined at the Elizabeth site had DJD (Frankenberg et al., 1988), and “almost all individuals over 35 years of age” (p. 1086) experienced DJD at Carrier Mills (Bassett, 1982). Indian Knoll appears to have suffered the greatest frequency of DJD among the comparable populations and is similar in pattern to the Oak View Landing site; 39% (180/463) of adult individuals manifested arthritic lesions in the spine and males (104/248, 42%) exhibited more degenerative changes than did

females (76/215, 35%). Eleven percent (44/407) of the Indian Knoll population had extravertebral DJD, found in joints such as the wrist, elbow, knee, and foot (Kelley, 1980; Figure 8).

At Windover, a coastal site in Florida, 25% (118/480) of all observable joints were affected by DJD (Figure 8). Not surprisingly, the vertebral column (47%) was highly affected followed by the shoulder and elbow (33%), hip and knee (25%), hand (4%), and wrist (1%) articulations (Wentz, 2006).

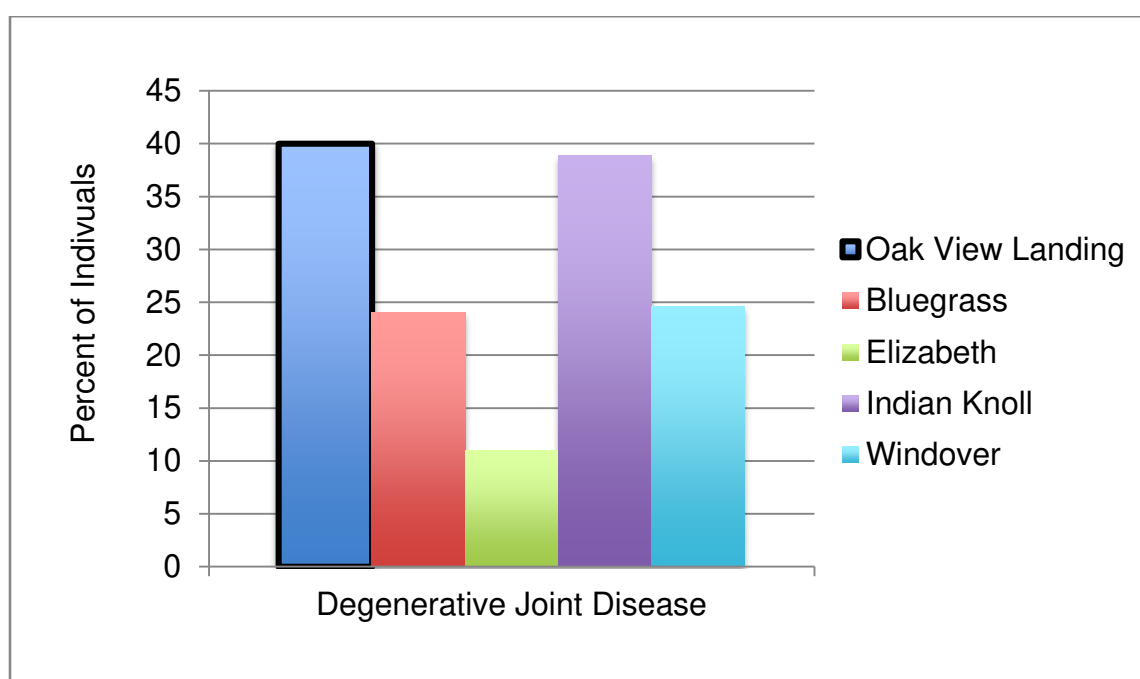


Figure 8. Percent of individuals affected with degenerative joint disease within hunter-gatherer populations. Bordered graphic represents the Oak View Landing site.

In summary, the Oak View Landing population exhibits many health patterns that are typically seen and expected among Southeastern hunter-gatherers. They were tall in stature and appear to be minimally affected by metabolic and infectious diseases; however, Oak View Landing inhabitants did have high rates of dental caries and AMTL. Additionally, as expected, these

individuals have high frequencies of degenerative changes and traumatic injuries that are commonly seen among highly mobile groups.

Mortuary Practices

Preferential or differential treatment of the dead was examined in this Southeastern Archaic population. The position of interment and inclusion of grave goods were examined as they pertain to age, sex, and pathology. The results found were then compared with other foraging groups to determine any similarities or differences for the way these groups treated their members at death.

Position of Burials

Excavation reports provided by the McClung Museum allowed for the analysis of both adults ($n = 50$) and subadults ($n = 30$) in the determination of burial patterns at Oak View Landing. Positions of interment of individuals found at the Oak View Landing site were highly varied: left or right side, supine or sitting, and semi-flexed or flexed. As may be seen in Figure 9, females were more likely to be flexed than semi-flexed, and males and subadults were more often placed on their side than females. There were two cases, one adult male and one adult female, that were buried lying face down. One adult female and one individual of indeterminate sex were buried in the sitting position. Males and females of all age groups were interred in each position, although no subadults were found to be sitting or face down. Thus, no strong pattern of burial differences by age or sex appeared to be present.

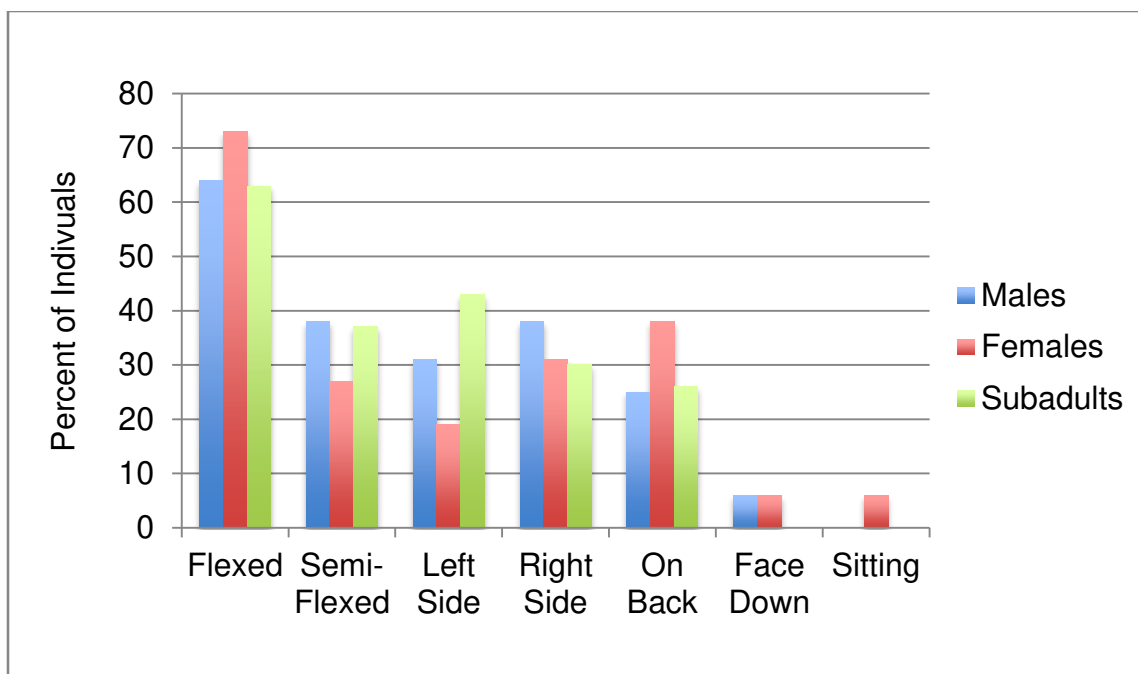


Figure 9. Frequency of burial positions of males, females, and subadults at the Oak View Landing site.

When considering mortuary patterns of comparable groups, it was found that Bluegrass was similar to Oak View Landing in that there did not appear to be strong variation of interment according to demographic categories. Twenty-three percent (19/82) of burial positions, which were determined based on site photographs, revealed males, females, and subadults to be interred as tightly flexed, loosely flexed, or supine (Mayes, 1997). Webb (1946), and Milner and Jefferies (1998) reported a flexed position as the preferred burial placement at the Indian Knoll and Read sites. Four out of five (80%) burials of identifiable interment positions at the Ashworth site were semi-flexed; the fifth individual was buried in a tightly-flex position. Males, females, and subadults were all represented (DiBlasi, 1981).

In the arid regions of southwest Texas and bordering Mexico, bundle burials were the most common method of interment among the hunter-gatherers in the Lower Pecos region. These individuals were usually flexed and wrapped in matting or animal hides and interred in rockshelters (Turpin, Henneberg, & Riskind, 1986). Archaic Plains samples from multiple sites throughout the central Plains also show a preference for flexed interment ($n = 70$, 73%). Over half of the burials were sitting up and 21% were placed on their side or back (Finnegan, 1981).

Grave Inclusions

Of the total 64 Archaic individuals excavated at Oak View Landing, 20 (31%) were associated with grave goods. Thirty percent of adult individuals of known sex (10/34) and 33% of subadults (10/30) were interred with one or more inclusion of either utilitarian or ornamental objects (Table 11). Projectile points were found with all adults, and both males and females had objects of utilitarian function including drills, blades, and awls. Animal remains (i.e., bone and/or teeth) were interred with males, females, and subadults; all of the remains appear to be non-utilitarian in nature such as dog mandible and teeth, beaver teeth, deer remains (e.g., calcaneus, scapula), and a squirrel mandible. Dog burials were associated with two individuals, one adult male and one subadult. As seen in Table 11, there was a higher frequency of subadults (23%) than adults (15%) associated with grave goods of non-utilitarian function, including gorgets, beads, and hematite; this finding, however, was not statistically

significant. Furthermore, there was no statistical significance found based on sex when considering the inclusion of grave goods.

Table 11

Percent and Statistical Significance Values for Grave Inclusions at the Oak View Landing Site by Age and Sex

	Males (<i>n</i> = 18)	Females (<i>n</i> = 16)	Subadults (<i>n</i> = 30)	<i>p</i>
Grave goods	7 (39%)	3 (19%)	10 (33%)	
Males vs Females				.19
Adults vs Subadults				.74
Utilitarian	7 (39%)	3 (19%)	9 (30%)	
Males vs Females				.19
Adults vs Subadults				1.00
Non-utilitarian	3 (17%)	2 (13%)	7 (23%)	
Males vs Females				.73
Adults vs Subadults				.37

Thirty-four percent (28/82) of individuals at the Bluegrass site were associated with grave goods. Adult males were more frequently associated with grave goods, as well as multiple types of goods, when compared to adult females and subadults. Furthermore, males were more frequently interred with utilitarian items such as awls, lithics, and antler tools, while females were buried primarily with ornamental objects such as beads and shells. Objects of both utilitarian and ornamental purpose were associated with the four subadults interred with artifacts (Mayes, 1997).

According to the burial descriptions, 23% (11/48) of the individuals interred at the Elizabeth site were associated with grave goods. Females and adults of

indeterminate sex were not found in association with grave goods. Fifty percent of males (7/14) and 33% of subadults (6/18) were associated with either ceremonial or utilitarian objects such as beads, hematite, bivalves, projectile points, antler hafting objects, and drills (Charles, Leigh, & Albertson, 1988). Twenty-six percent of total burials ($N = 257$) from the Read shell midden in Kentucky were associated with grave goods. Males ($n = 50$, 30%) and females ($n = 32$, 28%) were equally associated with objects in general and types in particular. The prevalence of subadults ($n = 30$, 30%) with grave goods at the Read site was also similar to that found at Oak View Landing (Milner & Jefferies, 1998). According to Turpin et al. (1986), members of the multiple Lower Pecos groups analyzed in their study revealed no preferential treatment based on sex or age in regards to the inclusion of grave goods.

Position, Goods, and Pathology

In addition to grave goods being found in association with individuals of all ages and both sexes, they were also recovered with individuals buried in varying positions. Interment patterns of individuals with grave goods and/or pathologies were found to be similar to those found in group-wide analysis (Figure 10). When considering pathological lesions and grave goods, no pattern of association was observed. Mayes (1997) reported similar results in her analysis of the Bluegrass site.

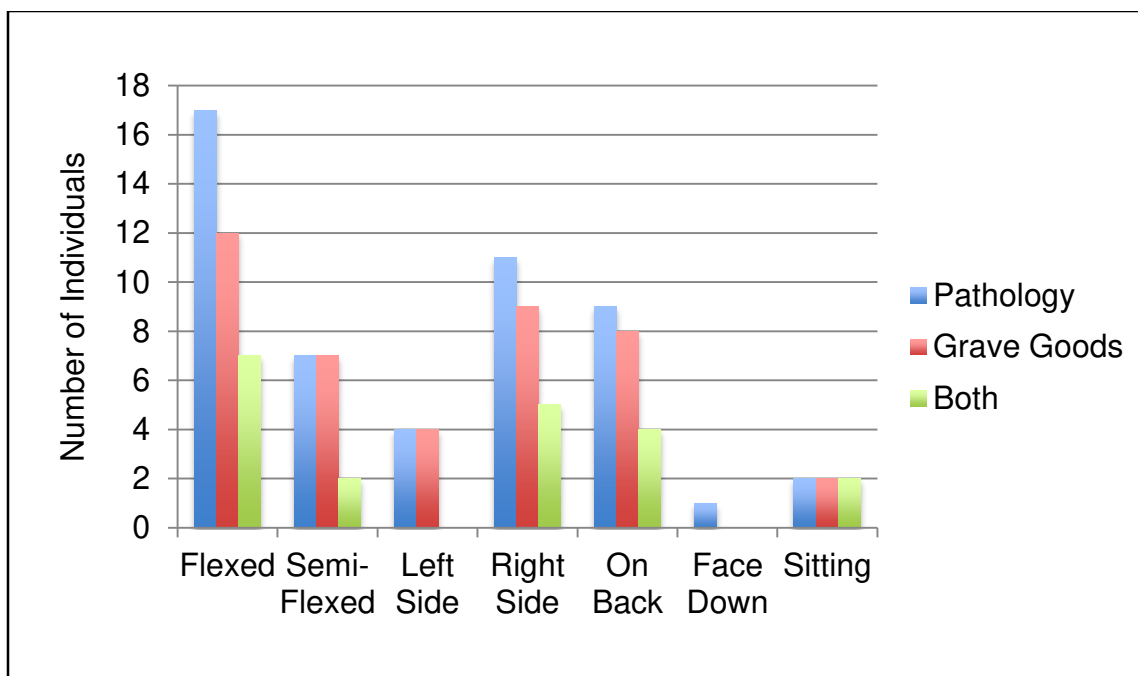


Figure 10. Number of individuals interred at Oak View Landing based on burial position associated with pathology, grave goods, or both.

In summary, the mortuary treatment of the Archaic individuals interred at Oak View Landing appear to be highly variable with little to no pattern based on sex or age. Although there were tendencies in burial position, females were more often buried in a flexed position, and males and subadults were interred on their sides, there were no strong patterns. Furthermore, the inclusion of grave goods did not present any strong indications of preferential treatment based on sex and age, males and subadults were slightly more associated with grave goods in general and of utilitarian type in particular, but this was not found to be statistically significant. When compared with other hunter-gatherer groups, these findings fall within the gradient of expressed agency expected in egalitarian cemeteries.

Discussion

Commonly measured health indicators in bioarchaeology were implemented in the examination and analysis of the human remains recovered at Oak View Landing, a Southeastern Archaic site located in the Kentucky Lake Reservoir. Although there was an increase in sedentism from Paleoindian through Late Archaic, Southeastern Archaic archaeology provides evidence to suggest that these populations maintained small group numbers and were highly logistically mobile (Amick & Carr, 1996), resulting in minimal onslaught from infectious diseases (Larsen, 1997). A wide range of resource exploitation (Geremillion, 1996; Styles & Klippel, 1996) coupled with an egalitarian social structure produces similar levels of health and morbidity patterns among and between Archaic groups (Flanagan, 1989). Overall, the results from this study were generally those expected to be associated with hunter-gatherers, but there were differences between this group and other foraging populations in the Southeastern United States (e.g., Kelley, 1980; Mayes, 1997) as well as other areas such as the American Midwest (e.g., Larsen, 1981), Channel Islands of California (e.g., Kerr, 2004), circumpolar regions (e.g., Link, 1999), and the Great Plains (e.g., Winn, 2012).

Overall Health Patterns

Paleopathologically, the inhabitants at Oak View Landing fit patterns seen in both hunter-gatherers and later more sedentary cultures such as the Mississippian. Further, it appears that when compared with other groups, this population differs when sex is considered. Indicators reflecting childhood health

were found to be well within the expectations of foraging societies. Males and females at Oak View Landing with measureable long bones were found to be amongst the tallest in stature when compared to other foraging groups. However, the sexual dimorphic ratio was among the smallest suggesting environmental stress, males are more vulnerable to health threats because they are less buffered than females (Stinson, 1985). The stature of a population has been shown to be an indication of the amount of protein consumed in a population; populations that consume foods high in protein during growth and development tend to be taller than groups with little access to protein-rich foods (Bogin, 1988). However, the mean stature of this population may be skewed due to such a small number of individuals whose long bones were preserved well enough to be measured.

In addition to tall stature, there was no evidence of metabolic disease (i.e., PH and CO) found in the Oak View Landing skeletal series. Expansion of the diaphysis in the skull and eye orbits has been attributed to multiple causative factors in the literature. Authors suggest that iron deficiency due to factors such as pathology, prolonged nursing by adult females, and a diet low in iron results in anemic lesions (El-Najjar et al., 1976; Stuart-Macadam, 1992; Walker, 1985). More recently, however, research suggests that a deficiency in vitamin B₁₂ due to diet or infection causes the expansion of the cortical table and a diet low in vitamins B₁₂ and C results in the expansion of both the cortical table and the eye orbits (Walker et al., 2009). Because there was an increase in the exploitation of white-tailed deer and aquatic resources (including mussels) during the Holocene,

the high protein available in both these resources undoubtedly resulted in the tall mean average height at Oak View Landing. Furthermore, mussels are an exceptional source of vitamin B₁₂ (Watanabe, 2007) and would account for the low prevalence of PH and CO found in this Archaic population.

Contrary to the indication of good childhood health as evidenced by tall stature and no evidence of metabolic disease, the frequency of LEH, a non-specific indicator of childhood wellness, was higher than expected. LEH were more commonly found in the dentition of males and the age at episode formation was found to be younger than females; as with stature, this suggests that males were more vulnerable to environmental stress (Stinson, 1985). These results were found to be greater than those seen in other Southeastern Archaic groups; however, they were similar to the rates seen in hunter-gatherer populations in the circumpolar regions. Seasonal scarcity of resources and the possible competition within a territory during growth and development may account for the disruption of ameloblastic production as is seen in harsh environments such as those in circumpolar regions. According to Anderson et al. (1996), Archaic populations living north of 33°N practiced logistical collecting strategies. The use of a central base for the return of individuals with resources in colder climates may have resulted in lean procurements during winter months and an increased amount of resources during the warmer months. Thus, individuals at Oak View Landing may have experienced the periodicity of seasonal malnutrition (Buikstra, 1976), resulting in the pattern of LEH seen, followed by an abundance of protein resulting in compensatory growth (i.e., catch-up growth).

Contrary to the evidence found of a protein-rich diet, the frequency of dental disease was surprisingly high in the Oak View Landing population. Rates were greater than those seen in Southeastern Archaic groups as well as groups of differing environments but similar subsistence patterns. On par with Mississippian cultures, the prevalence of dental caries at Oak View Landing was what is to be expected in agricultural populations (e.g., Larsen, 1997; Listi, 2011; Powell, 1991). Unlike the pattern of dental caries seen in most populations, males were slightly more affected than females; however, females had a greater number of teeth exhibiting decay. Furthermore, with the exception of the coastal Windover site in Florida, frequencies of AMTL were lower in other hunter-gatherer groups, including the Plains and circumpolar populations, when compared to Oak View Landing. Males were slightly more affected than were females. The patterns of dental decay and subsequent AMTL seen at Oak View Landing may be the result of a diet rich in carbohydrates, such as starchy mast and seeds and fruits - these resources were increasingly exploited during the Holocene (e.g., Chapman & Shea, 1981; Geremillion, 1996) – and may suggest that these resources were consumed by males and females at Oak View Landing, without preference based on sex. It should be noted that although there was an increase in the procurement of starchy mast and seeds, this did not compromise the overall health of the inhabitants at Oak View Landing and other Archaic foragers. Although the frequency of dental disease was found to be atypical of hunter-gatherer groups, the degree of dental attrition at Oak View Landing was characteristic of such groups. Every adult suffered some degree of

dental wear, and many suffered severe wear resulting in exposed cores of dentin. Although rates were not quantified in other Southeastern Archaic studies of attrition, qualitative observations were found to be similar – all adults affected with the onset at an early age. In addition to a diet consisting of hard-textured foods, such as nuts and seeds, the rise in innovative technology such as ground and polish stones further adds abrasive agents that results in severe dental attrition (Hinton, 1982).

Small foraging groups who are highly mobile are expected to have low incidences of infection. The results from the Oak View Landing population support this theory; evidence of infection (i.e., periostitis and osteomyelitis) was not common among these individuals. Archaic groups from the Southeastern United States (e.g., Kelley, 1980; Wentz, 2006) also had low levels of infection. In her study of the Bluegrass population, Mayes (1997) found only one adult individual whose sacrum and thoracic vertebrae were affected with periosteal lesions and suggested its etiology due to blastomycosis, a fungal infection found in river valleys (Buikstra & Cook, 1981). Although these lesions are characteristic of tuberculosis, the infectious pathogen thrives in dense populations that are sedentary (Larsen, 1997) and is unlikely to be found in small, mobile Archaic groups.

Although the egalitarian social organization expected of the majority of hunter-gatherer groups to succeed usually results in robust health due to equal access to resources and the reciprocity of goods, it does increase the frequency of traumatic injury and mechanical wear to bony elements and articulating

surfaces because of their mobile lifestyle and necessity to hunt and gather across large territories, individuals at Oak View Landing are no exception to the rule. Nearly one-third of all adults were afflicted with traumatic injuries, most of which are associated with interpersonal violence. Interestingly, the rates at Oak View Landing were higher than those found in other Archaic groups.

Furthermore, males are usually evidenced to be more frequently affected than females, but this was not the case at the Oak View Landing site: males and females were equally affected by traumatic injury in general, with interpersonal violence as the causative factor in particular. Warfare and raiding between competing groups may explain the high level of violent trauma seen at the Oak View Landing site, especially as it pertains to females (Wilkinson, 1997). These high frequencies of trauma may be due to site location. Many Archaic sites have been identified in the Tennessee Valley (e.g., Eva, Cherry, Ledbetter, Hog Creek, McDaniel; as cited in Magennis, 1977) and may suggest a highly competitive territory for resources. Degenerative changes at articulations in the Oak View Landing population were fairly high when compared with other groups, with the exception of Indian Knoll in which similar results were seen. Correlating expectations based on research across time and space, the spine was the most commonly affected site for DJD. The high incidence degenerative changes in the spine of the Oak View Landing site is reflective of a group that is highly mobile beginning early in life, thus, time and opportunity to develop DJD is at a greater level in a foraging group (Larsen, 1997).

As demonstrated by this study, there appears to be a spectrum of frequencies when examining health indicators among hunter-gatherers. Most groups exhibit results from one or more indicators that were either lower or higher than expected which set them apart from other groups and further illustrate the autonomy and/or the resources available to groups in differing environments. Health patterns seen at Oak View Landing were more or less as expected. With the exception of notably high frequencies of dental disease, this group was relatively healthy as indicated by tall stature and minimal incidence of metabolic and infectious disease. Furthermore, the level of frequency of dental wear, DJD, and trauma due to diet and/or activity were found to be typical patterns seen in hunter-gatherer groups.

Mortuary Patterns

No strong patterns of preferential or differential treatment of the dead at Oak View Landing were seen in this study. Burial position and the inclusion of grave goods were highly varied among males, females, and subadults, though some tendencies were present. This is not dissimilar to findings in the research of other egalitarian groups in the American Southeast (Mayes, 1997). However, preferential burial positions were found in regions of the Southwest and the Plains populations (Turpin et al., 1986; Finnegan, 1981; respectively). As was found with skeletal examinations, there were no significant burial differences based on sex. Both males and females were interred with both utilitarian and non-utilitarian items, including ritual objects. In contrast, sites such as Bluegrass and Elizabeth indicate that males were more frequently associated with grave

goods, especially utilitarian items (Mayes, 1997; Frankenberg et al., 1988; respectively). However, individuals interred at the Read site and groups in the Lower Pecos were found to be equally associated with grave goods (Milner & Jefferies, 1998; Turpin et al., 1986; respectively). Thus, burial patterns and grave inclusions at Oak View Landing may reflect a lack of status that is crucial for the establishment of leadership necessary for hunter-gatherer groups to survive.

In summary, the results from this multifaceted, bioarchaeological study of the Oak View Landing site suggests that its inhabitants may have experienced similar hardships as other foraging groups. The average mean height and lack of metabolic and infectious diseases suggest a healthy population, however, the high prevalence of morbidity among males and violence among females suggests that this population may have experienced times of nutritional stress from environmental conditions in a highly competitive territory. Furthermore, the mortuary patterns seen at Oak View Landing suggest there was a small degree of achieved status of adult males that is often seen in egalitarian societies.

CHAPTER V

CONCLUSIONS

During the mid-Holocene, the climate of the Southeastern United States was warmer and drier than current conditions known as the Hypsithermal interval. The landscape changed from braided streams to meandering channels, the sea levels stabilized (Schuldenrein, 1996), and the oak-hickory vegetation began to extend into the northern region while the southern region transformed into warm temperate forests (Anderson et al., 1996). Resources of deciduous species declined, but the exploitation of deer, aquatic species (Styles & Klippel, 1996), mast, seeds, and fruit (Chapman & Shea, 1981; Geremillion, 1996) increased. As the landscape changed the Archaic culture emerged to adapt to the new environment, its resources, and the competition for territory. Central base camps were used in logistical collecting strategies in regions north of 33°N in coarse-grained, heterogeneous environments with the use of curated tool kits, such as ground and polished stones, grooved axes, atlatl weights, and nutting stones (Anderson et al., 1996; Jefferies, 1996). The Oak View Landing site, located in Decatur, Tennessee, is located just north of 33°N may have been in an area of transition to include both cool and warm temperate forests.

Archaic populations were highly mobile and required a small number of group members and functioned as an egalitarian society. Members of the group had equal access to resources and reciprocity was highly valued (Danforth, 1999; Flanagan, 1989). The health of Archaic groups are generally found to have been robust with low frequencies of skeletal and dental pathologies such as

those caused by infection, metabolic disease, and cariogenic foodstuffs. However, these groups do generally suffer from degenerative changes, especially in the spine, and trauma, both accidental and intentional. Groups that are highly mobile have more time and opportunity for mechanical wear of articulating surfaces and increased risk of accidents and competition for territory with other foraging groups (e.g., Cassidy, 1984; Kelley, 1980; Mayes, 1997).

In the present investigation, the inhabitants at Oak View Landing in eastern Tennessee were found to both support and contradict well-accepted notions of Archaic health patterns. Congruent with previous studies, this population had a low prevalence of infection and metabolic disease. Small groups that are not sedentary do not provide an environment for infectious pathogens to thrive (Larsen, 1997). Further, it may appear that this group consumed a diet sufficiently nutritious so that metabolic disease (i.e., PH and CO) did not manifest, most likely due to the exploitation of mussels (Watanabe, 2007). Further, this group was taller, on average, than comparable groups, suggesting a protein-rich diet (Bogin, 1988). DJD and traumatic lesions were observed in many of the members of this group with frequencies similar to those seen in other Archaic populations.

The results from this study indicate that these individuals did not conform entirely to the health patterns expected to be observed in Archaic groups. The male-to-female height ratio was small, and males were more frequently affected with LEH. Because males are not as buffered for environmental stressors as females, these observations suggest that there may have been times of

hardship, possibly seasonal (Buikstra, 1976; Stinson, 1985). Furthermore, males and females had similar high frequencies of dental disease, suggesting limited division of labor and low sex based preference to the foods consumed (Berbesque, 2010), and traumatic injury due to interpersonal violence, possibly due to warfare and raiding (Wilkinson, 1997). Mortuary patterns at Oak View Landing further suggest that there may not have been as great a level of achieved status among males as is commonly observed in other egalitarian burial cases (e.g., Charles et al., 1988; Mayes, 1997).

Although statements about health patterns and sociopolitical structure can be inferred about the Oak View Landing skeletal sample, there were several challenges encountered in their study. The sample size is relatively small and may have skewed the results. Unfortunately, this is an innate challenge to the study given the group size of small bands of Archaic people coupled with the time elapsed since interment. Moreover, although the preservation was generally in fair to good condition, some of the individuals in general, and many osseous elements in particular, were not preserved well enough for observation further limiting this research. Sex indicators of one-third of the population were missing or poorly preserved, resulting in a limited number of individuals to conduct sex based analyses. Complete long bones were rare and substantive statements about stature could not be made. Although many contemporaneous samples were used for comparison in this study, most were not comprehensive in nature; thus, they provided a single facet of the population's health. To better understand

the differences between groups with a holistic perspective, groups need to be examined using multiple health indicators.

Although many health indicators were observed in this study, other markers may prove beneficial to further understanding the lifeways at Oak View Landing. The results from this analysis may suggest a seasonal stress pattern as indicated by LEH and tallness of stature (e.g., stressful events followed by times of bounty). To further investigate this theory, the examination of Harris lines may be helpful. Furthermore, future studies concerning biodistance of the Oak View Landing site and other sites, especially in the Tennessee Valley, may show patterns of marital patterns, territory, trade networks, as well as provide the possibility to collapse many groups together for a larger sample size. However, dental attrition and bone preservation may be too limiting to conduct studies on biodistance on this population, and DNA analysis is inherently destructive and expensive and often not permitted. Also, because they are often considered a good indicator of the general health of a population, the bioarchaeological examination of subadults at Oak View Landing would prove to be beneficial. Lastly, future archaeological investigations on lithics and other artifacts from the Oak View Landing site may help to further understand trade networks, rituals, status, and subsistence strategies practiced by these individuals and how they affected the health and lifeways of this group.

The results from this group suggests the inhabitants of Oak View Landing had a more cariogenic diet than their counterparts and may have suffered seasonal decline in access to protein-rich foods. Additionally, Archaic groups

suffered trauma from interpersonal violence, this group, however, appears to have suffered a greater degree of violence than other foraging groups. There were no apparent patterns of mortuary preference in treatment of adult males that is commonly seen in egalitarian groups. Although there were limitations to this study, it has proved to be beneficial to our understanding of Southeastern Archaic populations. When compared with other groups in similar and different environments, this group has shown that the health and mortuary patterns of egalitarian Archaic foragers are not as homogenous as is often suggested. This diversity among hunter-gatherer groups is critical to the broader underpinnings for human adaptations across time and space.

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