Cultural Determinants of Health:
A Review of Mississippian Mound Center Studies

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Introduction

With the intensification of modern technology and greater scientific knowledge, physical anthropology plays a crucial role in reconstructing past life-ways. Archaeologists are becoming more reliant on the studies conducted by today’s physical anthropologists. Several methods, old and new, are used to draw conclusions about such issues as diet, status and health.

The Mississippian period of the North Americas is characterized by the intensification of maize agriculture resulting in the development of chiefdoms. It is with the development of chiefdoms that archaeologists, with the help of the physical anthropologist, are able to interpret the association of status, diet, and health among Mississippian societies. Therefore, the purpose of this paper is to provide a concise literature review of the various interpretations of the relationship between status and health among Mississipians.

Literature Review

A great deal of literature has been produced relating to Mississippian societies. Both archaeological and physical anthropological investigations have been conducted throughout the past one hundred years. According to Mary Lucas Powell, an important Mississippian researcher, there exist two types of determinants of health. The first involves the environmental influences on health. The second, and the focus of this paper, are the cultural determinants of health. These include both status and gender (Powell 1988). It is necessary for archaeologists and physical anthropologists to work together in order to construct an accurate interpretation of the association of culture and health within a hierarchical society.
As it is impossible for archaeologists to observe, first-hand, the subjects of their study, they must rely on the material culture that remains in the archaeological record. Archaeologists are able to determine an individual’s status by examining his/her physical remains, as well as the material culture associated with the particular burial. Although the focus of this paper is the physical anthropological interpretations, I will briefly provide a description on various ways archaeologists are able to determine status. This description is by no means sufficient, but should provide a little background on the job of the archaeologist.

For the most part, the richness of grave goods reflects the wealth and social standing of the person buried (McIntosh 1999). The social persona of an individual includes factors such as age, sex, kinship affiliations, rank and social position. If an individual’s grave has a greater majority of prestige items associated with it than another individual’s grave, it may be assumed that the grave with the prestigious grave goods is one in which the individual yielded greater power, or status. Another indicator of social standing is architecture. It is likely that an individual of higher rank, status, or power may be buried within an altar, or close to impressive architecture such as a shrine or pyramid, as well as within an ancestral mound.

The remainder of this paper will be concerned with physical anthropological methods and techniques used to not only determine the health of an individual, but the association of cultural determinants of health as well. I will be taking a closer look at Mississippian societies by reviewing literature concerning two important Mississippian chiefdom centers: Moundville and Cahokia.

Moundville was one of the largest Mississippian centers in the Southeast. It is located
along the Black Warrior River in west-central Alabama. The population of Moundville began to increase with the intensification of the local production of Maize by 900AD. Moundville’s peak ranged a timespan of about 100 years (1200AD-1300). This was the time in which the entire region was consolidated into a single polity with a primary center at Moundville. According to Knight and Steponaitis (1998), at this center, both the elite and nonelite participated in the production and exchange of goods and crafts. They further describe the arrangement of public architecture at Moundville. They claim that the placement of mounds around the plaza suggest ranked status relationships. The amount of labor that must have gone into the construction of such architecture must have required a central authority in which to mobilize labor. By 1450AD, the gradual collapse of Moundville had begun (Knight and Steponaitis 1998).

The majority of the literature relating to Moundville comes from the works of Mary Lucas Powell. She has composed a remarkable book entitled Status and Health in Prehistory (1988). This has proven to be an excellent source for understanding the physical anthropological perspective regarding the cultural determinants of health. Throughout her book, Powell focuses on a variety of physical indicators of the impact a stratified society has on an individual’s health. These indicators include adult body size, dental health, skeletal pathology, among others. (Powell 1988)

Cahokia is centrally located in the Mississippi River valley in west-central Illinois. The Cahokia polity is unquestionably the most complex chiefdom-level society to emerge during the Mississippian period. The most intensive occupation of Cahokia dates to 1050-1150 AD (Ambrose 2003). At its peak, Cahokia covered an area of 13 square kilometers. Over 120
mounds, Cahokia is the largest and most impressive of all Mississippian centers. The city of Cahokia was inhabited from 1300 to 600 years ago. At its peak, the population reached 20,000 people. Cahokia was a planned city with elaborate public buildings and elite residences at its core. Like Moundville, this must have required a central figure to gather and control public labor projects. “The people of Cahokia had widespread commerce; stratified social, political, and religious organization.” (Cahokia Mounds State Historic Site). By 600 years ago, the city of Cahokia had been abandoned. Some blame the collapse of Cahokia on a depletion of resources resulting from a climatic change after 1200 AD. Whatever the cause of the fall of Cahokia may be, the impressive mounds and archaeological record left behind have allowed modern researchers to reconstruct the life-ways of this ancient city.

The extensive amount of literature concerning the city and culture of Cahokia and the American Bottom are overwhelming. Of particular importance for this paper is an article by Stanley Ambrose et al (2003) which describes isotopic analyses of bone from Mound 72 at the Cahokia center. According to Ambrose, the analysis of the burials associated with Mound 72 reveals status- and gender-related differences in health and diet.

**Study Results**

**Moundville.** Mary Lucas Powell’s book is a work centering around the biological and social aspects of human adaptations to the Mississippian lifeway at Moundville. As previously noted, Powell analyzes a variety of physical traits as a means to define the biological implications of social stratification in a Mississippian chiefdom center such as Moundville. She provides detailed descriptions of techniques and methods used in determining aspects of status and health
at Moundville. Furthermore, Powell makes a point to include the limitations of the study, such as the underrepresentation of burials throughout her study. Overall, Powell provides an exceptional work incorporating a variety of notable studies.

The connecting link between a ranked social organization and health is nutrition. It is nutrition, according to Powell, that is the “essential element of normal growth, development, and routine tissue maintenance” (Powell 1988:33). Powell further claims that the ranked social organization of Moundville influences differential access to food resources, particularly meat. This could further affect status-mediated variations in growth, development, and disease. These are examples of some of the expected physical results of social stratification; however, Powell’s study revealed that, at Moundville, the status-mediated access to nutritional foods such as animal products exerted only a minimal influence on the overall level of health. According to Powell, this may be the result of the benefits of living in an exceptional environmental setting. The Moundville environment was abundant with the essential elements for good health: protein from animals and vegetables, carbohydrates from plant foods, oils from seeds, etc. Powell further suggests that because the growing season was typically longer than other Mississippian sites, nutritional stress was minimal. Perhaps, in the case of Moundville, the exceptional environmental conditions in which the population benefitted, outweighed the consequences of stratification on health. As a result, Powell looks at several other aspects that may be results of a hierarchical organization.

It can be expected that in ranked chiefdoms, the higher status individuals do not tend to participate in subsistence or other strenuous activities. As a result, this lack of participation
among the elites spared them from exposure to soil mycoses and parasites as well as injuries associated with regular hunting. Powell claims that overall, elites were supported by the labors of the socially inferior individuals. Therefore they retained more energy, had less stress and better health. Powell discusses a variety of trace-element analyses of human bone samples taken from a variety of southeastern Mississippian sites. The results, however, did not adhere to the expectations Powell had predicted. Again, perhaps the abundance and variety of plants and animals available prohibited variation in health between the various status groups of Moundville. It is evident then, that environmental factors can counteract the affects of cultural determinants of health. Powell, therefore, takes a closer look at three categories of biological features in assessing the overall health at Moundville. These include body size, dental health, and skeletal pathology.

Adult body size reflects stress during the developmental years. It is the general tendency that well nourished individuals display larger body size than individuals with diets lacking in necessary nutrients. Dental health is influenced by diet in several ways. Powell claims that developmental dental defects reflecting stress include linear enamel hypoplasia. Furthermore, by examining occlusal surface wear of the teeth, it may reveal particular patterns characteristic of subsistence practices (Powell 1988). Enamel hypoplasia can be used in studying stress levels in prehistoric populations. Another indicator of diet revealed in dentition is dental caries. Caries can effect general health, the severity of which is determined primarily by the diet of the host. Powell further notes that “population segments divided by age, sex or ranked status, who typically consume diets deferring in the cariogenic properties may display different patterns of caries experience” (Powell 1988:73). She also claims that tooth wear can be an indicator of
gender- or status- associated activities. Diet directly contributes to the rate of tooth abrasion. Food processing techniques and the texture of foods consumed further influences dental wear. Finally, the third biological feature observed by Powell is skeletal pathology. Powell focuses on traumatic injuries, nutritional deficiencies, and disease. Traumatic injuries display important details about activity patterns and health threats. Skeletal evidence of anemia suggests a diet low in iron-rich foods such as meat. Infectious disease associated with soil fungi is less likely to be prevalent in adult elite males as they most likely did not include themselves in regular subsistence labor. Each of the three biological features studied by Powell is crucial in interpreting the effects of social stratification on health.

Powell provides a detailed account of her methods as well as her conclusions. When assessing adult body size, Powell examines six postcranial skeletal measurements. Among the females examined, Powell determined no consistent pattern of larger body size for elites, subelites, or the sample segment. Among the males, elite individuals were slightly larger and taller than nonelite individuals.

Dental pathology conducted by Powell is thorough and well documented. Her first dental study concerns enamel hypoplasia. She examined only undamaged crowns of maxillary and mandibular incisors and canines. For each tooth, the developmental age of the individual was calculated. She compared age with prevalence of effected units. The results of Powell’s hypoplasia tests follows. The distribution of effected units indicates no significant differences by sex or status. Powell found no evidence supporting a status relation to the prevalence of hypoplasia. There was no significant difference between the elite status segment and the other
two segments. Dental wear is the next biological feature tested. Powell chooses for her sample intact, unobscured occlusal surfaces of permanent first and second molars in adult dentitions. She compares the mean wear scores for adult females and males of various social status which revealed several patterns. Powell confirms the importance of the contribution of age to observed variation. However, there is only a small percentage of patterns in variation related to ranked status. Powell presumes that biological factors rather than social rank are the primary determinants of variation in molar wear. When examining dental caries and antemortem tooth loss, Powell selected undamaged, permanent teeth. While focusing on gender and status, Powell makes certain to include age groups as to investigate associations between advancing age and dental infection. Again, Powell found no evidence for patterns suggesting significant dietary differences between gender or the status segments. The variations in diet at Moundville did not have a significant affect on dental health.

Skeletal elements were examined macroscopically for evidence of pathology. Powell first delineated the anatomical distribution of observed lesions. According to Powell, diffuse and focal osteoblastic lesions were the most prevalent type of skeletal pathology at Moundville. This is a significant feature of a response to trauma, infection, or other stress. Therefore, Powell focused on trauma, anemia, and disease in the remainder of her examination. Traumatic injury among females of the elite segments is absent. Powell suggests that this may be due to their non-participation in activities such as subsistence labors. Elite males further display less traumatic injuries than individuals with lower status. Although Powell makes this claim, she does suggest that this may simply reflect the absence of mound burials containing very high-status males in the
sample. Powell continues by examining cranial material for signs of iron-deficiency anemia resulted in more status-related observations. Iron-deficiency anemia was less common among elite individuals than the nonelite individuals examined. This supports the idea that the elite diet consisted of greater animal-protein foods resulting in better health. Powell’s analysis of bone disease revealed abundant evidence for bone inflammation suggesting an impressive immune response to infectious disease.

Powell concludes her case study with a description of five levels of population experience with physiological stress as seen in the patterns of dental and skeletal pathology at Moundville:

1. Population-wide experience with nonspecific stress (resulting in enamel hypoplasia) and infectious endemic diseases (including but not limited to dental caries, suppurative osteomyelitis, tuberculosis, and endemic treponematosi) that affected most members of each generation.
2. Age-graded differential experience, typified by the absence in subadults of trauma, antemortem tooth loss, and vertebral lesions from mechanical stress.
4. Status-associated differences (to a minor degree) in adult male body size and skeletal evidence of iron-deficiency anemia.
5. Individual differences in growth, development, and resistance to pathological stress, typified by the appearance of one classic case of Pott’s disease (tuberculosis of the spine) and several examples of the classic treponemal skeletal lesions, caries sicca, and saber shins (Powell 1988:182-183).

Furthermore, Powell ascertains that it is the biological factors of age and sex that have greater influence in determining these patterns. Ranked status, then, may have played a minor role in the determination of health at Moundville. (Powell 1988)

**Cahokia.** Similar to Moundville, Cahokia reveals substantial status- and gender-related differences in burial style. Some of the burials are associated with significant amounts of prestige items, suggesting high status. According to Ambrose *et al* (2003), Mound 72 at Cahokia not only
includes graves of these high status individuals, but mass graves of young adult females of poor health as well. The poor health of these females suggests low status and nutritional stress. Ambrose et al focus their study of the cultural determinants of health at Cahokia by examining the burials of Mound 72. Their decision to choose Mound 72 as their primary focus is due to the variety of status- and gender-related burials associated with the mound. Cahokia was a powerful Mississippian center in the American Bottom. The power and diversity of Cahokia is revealed in the 272 burials in Mound 72. The treatments and pathologies of these burials suggest important differences in health and diet associated with status and gender. Their research suggested that those individuals associated with special burial treatments (i.e. high status) did not suffer from poor health and nutrition compared to that of low-status burials. Interestingly, the individuals of low status were mainly young adult females. Evidence suggests that these women were sacrificed at the site, most of whom displayed evidence of poor health and nutritional stress. Furthermore, Ambrose suggests, through dental analysis, that these women were not of the same population of the high status individuals. Ambrose claims that isotopic analysis of the skeletal remains of Mound 72 burials may suggest the dietary patterns among high status and low status individuals.

Ambrose et al claim that previous stable isotope analyses of Mound 72 skeletons examined only the carbon isotope ratios of bone collagen. According to Ambrose, the results of these studies are questionable due to poor bone preservation. Therefore, Ambrose et al compare stable isotopic analyses of bone collagen nitrogen and bone apatite carbonate carbon with collagen carbon isotopes in order to estimate the dependence on maize and other plants.
Thomas E. Emerson’s article further emphasizes the importance of this procedure. Emerson performed a carbon and nitrogen isotopic analysis from bone collagen to determine the contribution of maize to the population. Emerson asserted that carbon isotope ratios can be used to determine the amount of tropical grains such as maize in the human diet. Both apatite and collagen carbon isotope ratios, therefore, can be used to reconstruct both protein and non-protein components of diet. His analysis revealed a significant dependence on maize at Cahokia. (Emerson 2002).

Nine individuals buried in Mound 72 provided reliable isotopic data. Four of the nine were assigned to a high status group. According to Ambrose et al, isotopic analysis revealed that three of the high status individuals had significantly higher animal protein than the four low-status individuals. Higher and low status groups differed by 6% in apatite compare to only 1% of collagen. Although each segment, high and low status, displayed protein in their diets, most of the low status individuals consumed their protein from primarily low-protein foods such as maize. (Ambrose et al 2003).

Ambrose et al do suggest that collagen carbon isotopes are biased toward the isotopic composition of dietary protein, and underestimate the contribution of maize to the diets of low status individuals. However, analyses of collagen carbon and nitrogen and apatite carbon isotopes do help in interpreting the amount of maize in diets of the individual burials at Cahokia Mound 72. The results of Ambrose et al support the belief that the diets of high and low status individuals differed greatly in the amount of protein and maize consumption at Cahokia. (Ambrose et al 2003).
**Discussion**

Through the understanding of both physical anthropology and archaeology, we are able to better interpret the cultural determinants of health among Mississippian centers. Mary Lucas Powell’s work is an exceptional book, however, as she suggests, there is a lack of adequate remains representing all status level individuals. This poses problems in drawing accurate conclusions. Powell’s study does not fully support the belief that status and gender have an affect on Mississippian health. However, her study does seem to show that the ideal environmental conditions of Moundville may have allowed general health to remain fairly equal. Ambrose *et al* explain one specific way physical anthropologists are able to interpret past life-ways: isotopic analysis of remains. The results of their work fully support the belief that aspects of culture such as gender and status impact an individual’s diet and health. There seems, however, to be a limited number of studies aimed at defining cultural determinants of health at sites such as Moundville and Cahokia. A great deal more is necessary to draw definitive conclusions about the extent to which a hierarchical society manipulates the health of its people.
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