Biological Consequences of Segregation and Economic Deprivation:
A Post-Slavery Population from Southwest Arkansas

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Analysis of 80 skeletons from Cedar Grove, Arkansas, permits comparison of the skeletal data with historic accounts and interpretations of textual data. The high frequencies of skeletal lesions indicating dietary deficiencies and infectious disease demonstrates that this was a highly stressed population and that Cedar Grove participated in the historically documented nationwide decline of Afro-American health. The evidence is overwhelming that congenital syphilis was a major contributor to high infant mortality and population decline.

Afro-American history has engendered considerable debate among historians, economists, and demographers, particularly with regard to economics, health, and diet. Unfortunately, in contrast to the era of slavery, the post-emancipation period is characterized by poor documentation and has received little research attention until recently. The scarcity of post-emancipation demographic, disease, and dietary data can be attributed in part to the lack of record-keeping and inadequate census procedures resulting from the turmoil of "carpetbag rule" and the establishment of legalized segregation after Reconstruction. Because many censuses between 1850 and 1920 are defective and the death records nonexistent, demographers have employed complex techniques which have frequently produced divergent reconstructions. Interpreting the few disease and dietary records has been further complicated by the misinformation introduced by the recorder’s lack of knowledge, sociocultural biases, and human error. One alternative and complementary source of data, however, is not influenced by these biases of the past—the analysis of historic Afro-American skeletal samples obtained during cemetery relocation projects.

The past ten years have seen an explosion of Afro-American skeletal
studies covering the period from 1660 to 1920; they have included slaves and free persons from both the pre- and post-emancipation eras. Although skeletal data are subject to problems of preservation, availability, and sampling, they do provide information with different sources of bias from the historic documents and can be used to test hypotheses derived from the historic documents. This article illustrates the contribution which analysis of historic human skeletal remains can make to the study of economic history by taking selected hypotheses from the literature concerning post-emancipation Afro-Americans and testing them with the skeletal data obtained from a single cemetery located in southwest Arkansas.

I. MATERIALS AND METHODS

During construction of a revetment along the Red River in Lafayette County, Arkansas, the U.S. Army Corps of Engineers encountered a few grave markers and a prehistoric American Indian farmstead. The marked graves were relocated and the prehistoric site excavated. During excavation an additional 104 unmarked grave outlines were identified and historic investigation established that this cemetery had been used by the Afro-American community associated with the Cedar Grove Baptist Church. After extensive negotiations and legal determinations, 79 graves containing 80 individuals endangered by construction were excavated, analyzed, and relocated in a new cemetery.

The skeletal remains and all associated grave contents were excavated using standard archeological techniques and analyzed in an on-site field laboratory prior to reburial. Age and sex determinations, descriptions of pathological lesions, skeletal measurements, and dental observations were obtained using standard procedures. Historical and archeological evidence established that all excavated individuals were interred between 1890 and 1927.

II. DEMOGRAPHIC RECONSTRUCTION

Despite the poor quality of census data, it is generally agreed that Afro-American fertility declined significantly and (somewhat less certainly) that mortality increased between the Civil and First World Wars. Reynolds Farley concludes that Afro-American women born between 1900 and 1920 had the lowest fertility before or since, and notes that 30 percent never had a child. Those who did had fewer than those

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4 The osteological data collection procedures are described in detail in Jerome C. Rose, Gone to a Better Land: A Biohistory of a Rural Black Cemetery in the Post-Reconstruction South (Fayetteville, 1985), pp. 26-38.
5 Farley, Growth of the Black Population, p. 3; Higgs, Competition and Coercion, p. 17.
who had begun childbearing prior to 1850. In addition, the 1900 Afro-American mortality rate was 30.2 per thousand, nearly twice the 17.3 per thousand for Euro-Americans. The nonEuro-American infant death rate was 275 per 1,000 live births, while the maternal mortality rate in 1920 was still 13 per 1,000 live births and the neonatal death ratio was 72 per 1,000 live births. Physicians commonly noted that the Afro-American stillbirth rate was two to three times higher than the Euro-American rate.

Testing the applicability of the historic demographic interpretations to the rural Cedar Grove community involved transforming the skeletal age data into ratios. Using the ratio of skeletons aged less than one year to total skeletons produces an infant mortality rate of 275 per 1,000, which is identical to the national nonEuro-American infant mortality of 275 per 1,000 cited by Farley for this same time period. Using the ratio of skeletons aged younger than birth to total skeletons produces an estimated stillbirth rate of 62 per 1,000, close to Farley’s 1920 national nonEuro-American rate of 72 per 1,000. The results suggest that the Cedar Grove community followed the national trend of high subadult mortality and that this community was highly stressed during the post-emancipation period. Subadult demography is the most sensitive indicator of the biological success of a population and is used here to the exclusion of the adult profile due to space limitations. Subadult ages are determined by observation of dental development. Dental ages deviate little from chronological age, making this method the most reliable for reconstructing demographic processes.

III. RECONSTRUCTION OF DISEASE PATTERNS

In addition to the high overall mortality rates, Henderson Donald’s examination of disease records shows that Afro-Americans suffered a higher mortality than Euro-Americans from all major diseases except cancer. Using the 1900 census, Farley lists the most frequent causes of Afro-American deaths as tuberculosis, pneumonia, nervous disorders, diarrhea, typhoid fever, and malaria. Both tuberculosis and pneumonia were major killers of Afro-Americans, with Afro-American tub-

6 Farley, Growth of the Black Population, p. 3.
9 Kiple and King, Another Dimension, p. 188.
11 Ibid., p. 209.
Tuberculosis rates being reported as three times higher than Euro-American rates.

In support of this historically derived disease pattern, the Cedar Grove skeletal series exhibits numerous pathological skeletal lesions, with almost 90 percent of the entire sample exhibiting at least one lesion and averaging 12 per individual. Of the 11 neonates, 9 (81.8 percent) exhibit systemic active periostitis, or inflammation of the tissue covering the bone, which indicates systemic infection, while one neonate has no lesion and a second shows healed endocranial periostitis. The 17 children between 3 and 20 months of age display 41.2 percent active systemic periostitis and 35.3 percent active endocranial periostitis. Endocranial periostitis is inflammation of the tissue covering the internal surface of the cranial bones and can only be caused by systemic infection.

The adult skeletal lesion frequencies are high, 100 percent for the 15 males and 86 percent for the 21 females. The infection rates of the lower limbs are high both for males (60.0 percent) and females (52.4 percent). Comparison of these infectious lesion frequencies with other Afro-American skeletal samples shows them to be higher than the available pre-emancipation free Afro-American samples and all but one slave sample. Thus, the assertion that morbidity and mortality increased among post-emancipation Afro-Americans appears applicable to southwest Arkansas, although there are no pre-emancipation skeletal data for comparison. This assertion rests entirely on the fact that the prevalence of infectious disease in the Cedar Grove community exceeds the pre-emancipation levels found in other locations throughout the South.

One lesion complex deserves special mention for its support of the historical importance of tuberculosis. Rib periostitis not associated with systemic infection has been identified in two children (13 and 20 months), one adult male, and two adult females. The location of the lesions on the medial surface of the ribs and their appearance conform with lesions associated with pulmonary tuberculosis among cadaver specimens. This establishes the presence of pulmonary tuberculosis at Cedar Grove and associates it with 6 percent of the deaths. This percentage of rib lesions may be very significant because another study demonstrated that only 8.76 percent of the 445 cadavers documented as having died of tuberculosis had rib lesions.

14 Kiple and King, Another Dimension, p. 188; Holmes, The Negro's Struggle, p. 76.
IV. DECREASED FERTILITY

Historians have proposed three explanations for the postulated reduction in fertility.18 Robert Higgs suggests that because of declining mortality, parents required fewer births to produce the desired number of surviving children and that as a consequence Afro-Americans moved away from the unrestrained fertility of slavery toward some form of economically based family planning. Farley rejects this possibility because Afro-American fertility was low between 1930 and 1942 when there is little or no evidence for use of effective birth control, while after World War II fertility increased despite a documented increase in the use of birth control. The changes in fertility could also be associated with increased age at marriage and first pregnancy, but Farley implies that this explanation is not testable with the data he had available. Finally, increased disease and a decline in dietary quality could provide a mechanism for decreased fertility. Specifically, Farley explains the high stillbirth rate and decreased fertility by citing a 20 percent venereal disease infection rate among Afro-American females and an infant death rate in 1900 of 2.7 per 1,000 live births due to congenital syphilis. The significance of syphilis is that it can reduce a woman’s chance of delivering a live child by 84 percent and thus may be the principal reason for the large number of Afro-American women who were never mothers.

Jerome Rose and Philip Hartnady have marshaled the skeletal evidence to demonstrate the presence of congenital syphilis at Cedar Grove and contend, in concordance with Farley, that this disease is responsible for the high stillbirth and neonatal mortality rates.19 To summarize their evidence briefly, all five Cedar Grove skeletons with dental ages younger than birth (7 to 8 fetal months) exhibit systemic periostitis involving virtually every bone. All but 2 of the 11 individuals dying at birth exhibit systemic periostitis, as do 48 percent of the 18 who died between 3.0 months and 3.5 years. Taken together, the high frequency of prematures with systemic periostitis, the high neonatal mortality associated with active systemic periostitis, and the absence of systemic periostitis after 3.5 years, all suggest congenital syphilis as the dominant disease entity. At Cedar Grove the bone-specific ranking by frequency of periostitis involving the adults is tibia, fibula, radius, ulna, and femur—a ranking fairly consistent with that reported for venereal syphilis. Of particular importance at Cedar Grove is the high frequency of periostitis of the arm bones, a location fairly uncommon for infectious diseases other than venereal syphilis.

19 Rose and Hartnady, “Infectious Skeletal Lesions.”
V. NUTRITIONAL RECONSTRUCTION

Fewer analyses of the economic and dietary patterns of the post-emancipation period exist and only generalizations from various locations throughout the American South are available. On the whole the diet of post-slavery Afro-Americans was coarse and consisted of hominy, cornbread, fat pork, coffee, rice, molasses, and occasional vegetables. Kenneth Kiple and Virginia King state that diet went from bad under slavery to worse under freedom. Roger Ransom and Richard Sutch estimate that the total southern per capita output of food and swine declined by one-half from prewar levels and that 60 percent of small southern farms produced inadequate supplies of corn and other grains.

It is not certain exactly what dietary changes occurred in Cedar Grove after emancipation. The 1865 contract negotiated by the Freedmen's Bureau between the former slaves and Sentell family called for provision of a wage, rations, housing, and one acre of land per household in exchange for labor on the plantation. This contract labor system soon came to an end and the large plantations were broken up into individual sharecropping allotments. The system of advancing loans for seed and supplies which was commonly introduced throughout the South usually served to keep the sharecroppers poor and in debt to the landowners and merchants. Conditions deteriorated further in 1888 when a rapid decline in cotton prices left all southern Arkansas farmers poor and in debt to the stores. A further disaster occurred in 1905 when the boll weevil arrived in southeast Arkansas and virtually wiped out the cotton crops. The process of segregation and political disenfranchisement began with the passage of new discriminatory voting laws and the first Arkansas segregation law, the separate coach act, in 1891. These political and social changes, in combination with the farm price crisis, should have seriously and adversely affected Afro-American diet and health in the Cedar Grove area.

There is abundant evidence of dietary deficiencies in the Cedar Grove skeletal sample. The high rate of active expansion of the bones within

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21 Ransom and Sutch, One Kind of Freedom, p. 151.
22 Rose, Gone to a Better Land, p. 12.
23 Higgs, Competition and Coercion, pp. 37–93; Ransom and Sutch, One Kind of Freedom, pp. 56–199.
27 Evidence for dietary adequacy and nutritional deficiencies observed on the skeleton reflect the actual nutrients delivered to the tissues of the body and not necessarily the nutritional value of the
the eye orbit (cribra orbitalia) among children (58 percent) and the rates of healed cranial (porotic hyperostosis) and orbital bone expansion among the adults (males 33 percent, females 24 percent) indicates extensive anemia. Most of the anemia can be attributed to iron deficiency resulting from a reliance upon corn and a lack of red meat in the diet, as suggested by the historical literature. The 24 percent craniotabes for children dying between 3 and 20 months can be attributed to vitamin D-deficient rickets associated with the postulated low milk consumption. At least some of the extensive childhood periosteal deposits and the ossified hematomas among the adults may be attributed to vitamin C deficiency caused by a lack of fruits and vegetables. These high rates of lesions specific for nutrient deficiencies indicate either that the Cedar Grove community between 1890 and 1927 did not have access to these nutrients or else their bodies were unable to utilize them.

One infectious lesion complex which can shed light on nutritional adequacy is the age-cumulative increase of lower leg infections. The location of the tibia just below the skin makes it vulnerable to frequent introductions of bacteria from relatively inconsequential accidental wounds. Thus the frequency and severity of infections should increase under conditions of reduced resistance to disease, when the body’s defense mechanisms permit bacteria which would be normally warded off to become established. In contrast the fibula is located deep within the leg muscles and bacteria can reach this bone only through major trauma to the leg or serious infection of adjacent tissues such as the tibia and muscles. Thus infections of the fibula indicate the frequency of severe trauma or spreading infection, and are far more serious than tibial infections alone. Periostitis of the tibia is frequently found in skeletal collections, but periostitis of the fibula is only half or even less frequent. The age-specific frequencies of adult healed tibia infections ranged between 56 and 90 percent, while the fibula rates range between 33 and 100 percent. Both the high frequency of tibia and fibula periostitis and the concordance of rates between the two bones suggest greatly diminished disease resistance among the people of Cedar Grove. This

foods consumed. Both absorption of nutrients by the digestive organs and availability for absorption are influenced by the individual’s parasite load and active diseases. See Nevin S. Scrimshaw, Carl E. Taylor, and John E. Gordon, Interactions of Nutrition and Infection (Geneva, 1968), for a more detailed explanation of these phenomena. Reconstruction of the influence of pathogens and parasites requires analysis of both the foods available and the nutritional adequacy of the diet obtained from the skeleton. Historic dietary records are not available for Cedar Grove, but biochemical studies of the bone and hair samples for dietary reconstruction are currently under way.

29 Ibid., p. 290.
interpretation is also consistent with the historical literature, which suggests poor dietary quality and high stress for Afro-Americans, as that could have reduced resistance to bacterial pathogens.

VI. NUTRITION BY AGE AND SEX

In addition to the problem of overall nutritional adequacy there is the question of how food was distributed by sex and age. Robert Fogel and Stanley Engerman contend that the slave diet was adequate in both calories and other nutritional components, while other historians contend that the diet was inadequate in most respects.30 Richard Steckel employed age-specific stature data to demonstrate that slave children were provided with inadequate diets, while working slaves received adequate diets which provided for substantial catch-up growth during adolescence.31 The Cedar Grove skeletal data allow us to test for changes in the distribution of nutritional resources by sex and age during the post-emancipation period.

The age-specific frequencies of infectious skeletal lesions show a relatively large increase between one and five years for the tibia, fibula, and endocranium, while 58 percent of the deaths between one and five years occur at 18 months of age. These two age-specific distributions suggest that weanling diarrhea was very common at Cedar Grove.32 This syndrome is characterized by low-protein weaning diets, which lower resistance to infection and initiate a cycle of diarrhea and infectious disease. Childhood diets were not nutritionally adequate at Cedar Grove.

Another source of age- and sex-specific nutritional data derives from histological examination of thin sections taken through the femur shaft centers of 15 males and 14 females from Cedar Grove which have been extensively described elsewhere.33 Most Cedar Grove males and females fall below the published values of cortical bone area for both clinically pathological contemporary, and nutritionally stressed prehistoric, samples. Comparison of the number of bone resorption spaces and forming osteons (indicating new bone formation) with both clinical and prehistoric data indicates that in the Cedar Grove sample both sexes exhibit higher ratios of resorption to formation than either contemporary clinical samples or nutritionally stressed prehistoric groups. These histological data indicate that the Cedar Grove sample represents a population under severe nutritional and disease stress, and clearly

supports the historical reconstruction of decreased food production and limited availability of nutrients during the post-emancipation period, at least for this one community.

Two sets of results from this analysis have implications for the reconstruction of nutrient distribution by age and sex. First, the cortical bone cross-sectional thicknesses standardized by femur length suggest that the Cedar Grove adult sample experienced a normal pattern of bone growth and development, with no evidence of abnormal catch-up growth rates. This suggests that Steckel’s slavery pattern of poor childhood nutrition followed by adequate adolescent nutrition did not continue after emancipation. Second, as a group the Cedar Grove males exhibit excessive bone porosity and failure to maintain bone which exceeds that of the females. In addition, the three youngest males (20 to 29 years of age) have lower adjusted cortical thickness values than females of the same age and older males. This is unusual. Females in all other studied samples, both contemporary and prehistoric, always rank below males in bone porosity and maintenance. The typical pattern is attributed to the stresses and demands of pregnancy and lactation coupled with culturally ascribed assignment of the larger share of nutritional resources to the males. The ultimate implications of these results in the post-emancipation Afro-American economy are at present unclear. Were males so protective of their newly legitimized families that they flew in the face of standard patterns and deferred nutritional resources to their wives and children? Assuming that food resources for Afro-American adults were far more limited than during slavery, as suggested by some historians, were the males working just as hard in the fields as they did under slavery and thus unable to maintain bone in the face of caloric deficiencies? Whatever the ultimate explanation, this unique sexual pattern of bone maintenance implies that the distribution of work and nutrients by sex during the post-emancipation period deserves careful reconsideration.

CONCLUSIONS

The analysis of historic skeletons offers a useful source of data for testing hypotheses and reconstructions of post-emancipation Afro-American nutrition, health, and economic condition derived from documentary evidence. In particular, skeletal data are subject to biases far different from those the documents suffer. The mortality rates derived from the national censuses are in substantial agreement with those derived from the skeletal ages at death from the Cedar Grove cemetery and support the contention of high Afro-American subadult mortality. The Cedar Grove skeletal infection rates are higher than all

35 Ransom and Sutch, One Kind of Freedom, pp. 232-36.
but one pre-emancipation skeletal sample and confirm the inference of increased disease experience after emancipation. The presence and severity of congenital syphilis at Cedar Grove give credence to the suggestion that venereal disease was an important factor in the decline of Afro-American fertility at the turn of the century. The nutrient-specific deficiencies and overall poor nutritional quality of the diet at Cedar Grove are compatible with historical dietary reconstructions. However, the analysis of bone histology and infectious lesions by age and sex suggest hypotheses about social and familial distribution of food resources that have yet to receive critical historical analysis. Childhood diets do not appear to improve with emancipation, significant adolescent catch-up growth is not in evidence, and males are found to be more nutritionally stressed than females.