ARTICLE

A Bioarchaeological Study of African American Health and Mortality in the Post-Emancipation U.S. South

Maria Franklin and Samuel M. Wilson

After emancipation, most African Americans remained tethered to agricultural economies, while others migrated to cities seeking better opportunities. Although bioarchaeologists have made significant interventions in researching people of African descent, there are relatively few published comparative studies that address their morbidity and mortality after slavery. This study compares the bioarchaeological evidence for rural and urban southern United States populations to address disparities in health and longevity. It considers the biological effects of racism, including the health impacts of poverty, disease, and malnourishment. Although historians and demographers argue that urban life was especially detrimental to health, the results of this research suggest greater complexity in African American well-being. Whereas urban adults had higher midlife mortality and reduced longevity compared to their rural counterparts, both rural and urban children experienced poor health. Rural child mortality and morbidity varied significantly, suggesting differences in diet and disease exposure across rural communities. With regard to gender, rural and urban women died at younger ages than men. This disparity in mortality is partly attributed to black women's working and reproductive lives within the context of racism and gender inequality.

Keywords: racism and health, maternal health, enamel hypoplasia, porotic hyperostosis, rural and urban African Americans, mortality and longevity

Después de la emancipación, la mayoría de los afroamericanos permanecieron atados a las economías agrícolas, mientras que otros emigraron a las ciudades para buscar mejores oportunidades de vida. Aunque los bio-arqueólogos han llevado a cabo investigaciones importantes sobre la gente de descendencia africana, hay pocos estudios que se enfoquen en su mortalidad y morbilidad después de la esclavitud y de manera comparativa. El presente estudio compara la evidencia bio-arqueológica de poblaciones urbanas y rurales del sur de Estados Unidos para estudiar disparidades de salud y longevidad. Se enfoca en los efectos biológicos del racismo, incluyendo el impacto que pudieron tener la pobreza, la enfermedad, y la malnutrición sobre la salud. Aunque los historiadores y demógrafos han dicho que la vida urbana tenía un efecto negativo sobre la salud, los resultados de esta investigación sugieren que el bienestar de los afroamericanos era más complejo que si vivían o no en la ciudad. Los adultos urbanos tenían una mortalidad mayor hacia la mitad de la vida promedio, y una longevidad reducida comparada con los adultos rurales, pero los niños de áreas tanto rurales como urbanas tenían mala salud. Tanto la mortalidad como la morbilidad entre los niños rurales variaban mucho, lo cual sugiere que había muchas diferencias en dieta y en enfermedades en las poblaciones rurales. En términos de género, las mujeres rurales y urbanas morían a una edad menor que los hombres. La vida reproductiva y el trabajo de las mujeres negras, dentro del contexto del racismo, son factores que pueden explicar las disparidades de género en el bienestar.

Palabres clave: racismo y salud, salud materna, hipoplasia del esmalte, hiperostosis porótica, afroamericanos rurales y urbanos, mortalidad y longevidad

More than four million African Americans were emancipated by the end of the Civil War. Even though Reconstruction ushered in hopes for political and economic progress, African Americans continued to experience the crushing reality of racism, poverty, and labor exploitation (Ayers 2007). Southern blacks faced daunting challenges and

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struggled to reinvent themselves in the face of new economic realities and increasing racial violence. For those who remained in rural areas, they found that the war had devastated the infrastructure and the southern economy. Although they were no longer enslaved, impoverished African Americans were faced with negotiating labor contracts, often with the men who once owned them. For those who left farming behind, their migration transformed southern cities as black institutions and neighborhoods emerged. The Great Migration (1916–1970) reshaped U.S. demography, but many of its defining characteristics had arisen decades earlier (Ayers 2007:151–152). In towns and cities, these migrants and their descendants encountered racial discrimination in housing and employment.

Archaeological research has addressed the lifeways of freed African Americans and their descendants within the context of structural racism and economic subjugation in both urban and rural contexts (e.g., Barnes 2011; Davidson 2004; Wilkie 2003). Although related research in bioarchaeology has been on the rise, post-emancipation black experiences remain relatively unexplored (Blakey and Rankin-Hill 2016:111). Still, inroads have been made in addressing racial disparities in illness and trauma (de la Cova 2010, 2011; Thompson 2017) and the complexities of health status among people of African descent (Davidson et al. 2002; Rankin-Hill 1997, 2016; Vanderpool and Turner 2013; Watkins 2012). What these studies have in common is an emphasis on difference: "rather than pointing to a common experience of disenfranchisement, these studies highlight variation within and between these populations resulting from different social and biological responses to these constraints" (Watkins 2012:22). With this in mind, our objective is to consider the relative quality of life of African Americans from a bioarchaeological perspective.

Notably, we situate our research within the bioanthropology literature that defines race and gender as social constructs and the studies that emphasize the role of racism in health outcomes (Blakey 2001; Blakey and Rankin-Hill 2016; Geller 2008; Goodman 2016; Rankin-Hill 1997, 2016; Watkins 2012). Thus, our study is not embedded in biological notions of racial and sexual differences, and we stress the "lived experiences of discrimination" (Goodman 2016:71) in our interpretations of health and longevity. Although race is socially constructed, historically people of African descent have experienced poorer health than whites, even when controlling for socioeconomic status (de la Cova 2011; Kuzawa and Gravlee 2016). A related goal, therefore, is to contribute to the existing scholarship on the biological consequences of anti-black racism.

In this article, we consider what the health and longevity implications were for those who remained in rural areas as opposed to those who left for the city. We address the urban penalty thesis that claims that infectious diseases and the difficulties of city life led to rural–urban disparities in morbidity and mortality (Haines 2001). Bioarchaeology has the potential to complicate this generalizing framework, however. Research on African Americans reveals health variations between urban populations where socioeconomic context is implicated in well-being (Watkins 2012). Davidson and colleagues (2002:273) compared the data from the urban Freedman's Cemetery with the rural Cedar Grove Cemetery and concluded that the health status of these two populations was similar, a finding that challenges the urban penalty argument. We expand on this research by including osteoarchaeological data from additional rural cemeteries. We address whether urbanites paid a steep penalty in their quality of life relative to African American agricultural laborers. Alternatively, did racial inequality lead to equally poor health, regardless of where African Americans settled? We also address black women's health. Their household-related and extra-domestic labor were integral to the well-being of their families (Battle-Baptiste 2011; Jones 2009; Teague and Davidson 2011; Wilkie 2003). Not only having and rearing children but also taking on "othermothering" roles in caring for people (Collins 2000), black women assumed a tremendous burden.

Our biocultural study includes sites in Alabama, Tennessee, Arkansas, and Texas. We refer to these states as part of the South based on their legacy of slavery and former Confederate status (Ayers 2007:3–5). We begin with an

overview of the sites and their historical context. We then address rural versus urban mortality and the related data for stress, taking account of disease, living conditions, and diet in our interpretations. The evidence reveals that there were rural children who suffered from similarly adverse conditions as urban children. For those who survived to adulthood, however, early life stressors and continued residence in the city led to reduced longevity. A discussion of work-related stress and osteoarthritis follows. We then focus on black women and posit that their working and reproductive lives are implicated in their higher midlife mortality and reduced longevity in comparison to black men. The overall results of this study illuminate how racism and poverty detrimentally affected African American health.

Cemetery Case Studies

The urban (Freedman's Cemetery) and rural cemeteries (Elko Switch, Foster, Ridley Graveyard, Cedar Grove, and Providence; Figure 1; Table 1) selected for this study were excavated as cultural resource management projects, and none of our data are original. We hope to raise the visibility of a valuable yet underused source of data for African American bioarchaeology. The politics surrounding historic cemetery preservation should impress on researchers the importance of considering what is already available for study (Figure 2). We surveyed more than 30 cemetery projects and chose the best comparative samples available based on time period, site location, preservation, and comparability of data reporting. Still, there are limitations of the data and reporting that we address later. A total of 1,623 burials were identified, and we include 1,529 individuals in our analyses (Table 2).

Of the cemeteries considered here, the urban Freedman's Cemetery has been the most extensively researched (Condon et al. 1998; Davidson 2004; Peter et al. 2000). Until 1902, it was the only Dallas cemetery designated for African Americans, and thus it served various neighborhoods. The communities associated with the rural cemeteries mainly comprised farm laborers (Buchner et al. 1999; Oster et al. 2005:7; Shogren et al. 1989; Thompson 2009:19–20; Watkins 1985; Wilson 2005:17). The Cotton Belt, which extended from Maryland to Texas, included Tennessee, Arkansas, and Alabama, and these states had some of the highest rates of U.S. cotton production. Residents in each of these close-knit communities attended the same churches and schools (e.g., Buchner et al.

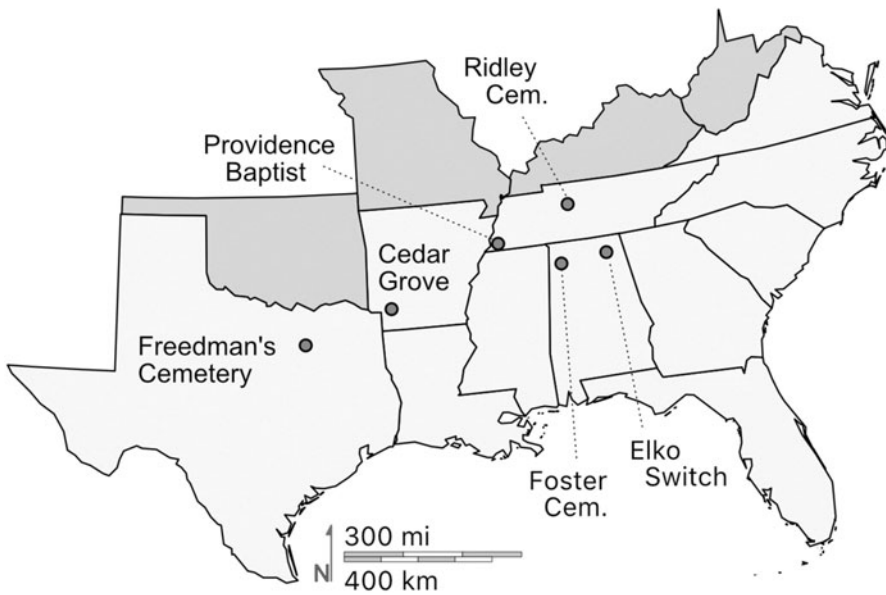

Figure 1. Cemetery site locations.

Table 1. Sites Examined in this Study.

Period & Phase	Site	Site Trinomial	County & State	N[a]	N[b]	N[c]
1850–1920	Elko Switch	1MA305	Madison, AL	56	56	20
Ph 1 1850–1870						
Ph 2 1870–1890						
Ph 3 1890–1910						
Ph 4 1910–1920						
1869–1907	Freedman's Cemetery	41DL316	Dallas, TX	1,151	1,151	53
Early 1869–1884						
Middle 1885–1899						
Pre-1900 1869–1899						
Late 1900–1907						
1880–1920	Foster Cemetery	1LA151	Lawrence, AL	223	223	73
1885–1940	Ridley Graveyard	40WM208	Williamson, TN	49	47	2
Ph 1 1885–1900						
Ph 2 1901–1925						
Ph 3 1926–1940						
1900–1915	Cedar Grove Cem.	3LA97	Lafayette, AR	79	79	0
1900–1935	Providence Baptist Church Cemetery	40SY619	Shelby, TN	65	65	3

Notes: For Freedman's Cemetery, there were 1,157 individuals buried in 1,151 graves. One burial, containing one individual, cannot be phased and is excluded from all analysis. For Cedar Grove, 80 individuals were interred in 79 graves.
[a]Number of human burials identified.
[b]Number of burials excavated.
[c]Number of burials with no human remains.

Figure 2. David Newton's *Dream of Freedom* sculpture, Freedman's Memorial Park and Cemetery (photo courtesy of Dallas native, Diana Petterson, and used with permission).

1999:41–45; Watkins 1985). For instance, Baptist churches founded both Cedar Grove and Providence cemeteries (Oster et al. 2005:20; Rose 1985). Social ties were also engendered through shared connections with place and the legacy of plantation slavery. People interred at Cedar Grove and Ridley had continued to labor on nearby plantations after emancipation (Buchner et al. 1999: 45–48; Watkins 1985:11–12). Similarly, Elko Switch and Foster cemeteries are located on grounds once owned by slaveowners (Shogren et al. 1989:273; Thompson 2009:19–20). Black communities made up of sharecroppers were still present near Elko Switch during the twentieth century (Shogren et al. 1989:245, 283). At Foster, the earliest burials were likely those of sharecroppers, yet the nearby presence of a post-1900 textile mill indicates that more recent interments may be those of mill workers (Thompson 2017:535).

We established a chronology of the sites consisting of three major periods for the analyses related to childhood morbidity and mortality (Figure 3). A primary consideration in devising this sequence was to ensure that rural samples were available for comparison with Freedman's.

Table 2. Sex and Age Distribution by Site.

	Ridley	Elko S.	Providence	CG	Foster	Freedman's	Total
Adult male (15+ yrs)	12	9	20	15	29	239	324
Adult female (15+ yrs)	15	17	18	21	20	241	332
Indet. adult (15+ yrs)	0	1	0	0	33	190	224
Subadult male (0–14 yrs)	1	0	0	0	0	0	1
Subadult female (0–14 yrs)	1	0	2	0	0	0	3
Indet. subadult (0–14 yrs)	18	27	25	44	45	486	645
Total	47	54	65	80	127	1,156	1,529

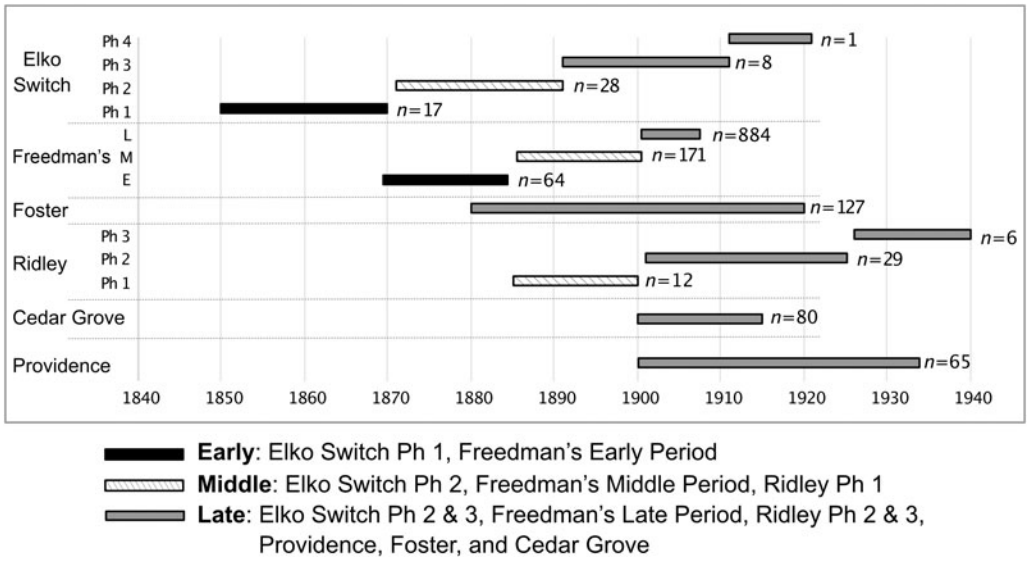

Figure 3. Sites by time period with number of individuals indicated for each interment phase (Elko Switch, Freedman's, Ridley) or time span (Foster, Providence, Cedar Grove).

The results are imperfect, because there are unavoidable temporal overlaps and phasing for Foster Cemetery is not available.

There are limitations inherent in the data and characteristics of the cemetery populations that will influence our results. About 30% of individuals were born enslaved; a few of the Elko Switch burials may date to slavery. Thus, some of the data relate to conditions under slavery. Migration also shaped demographics: young people tended to migrate to cities, whereas older people remained in rural areas. To some extent, our comparisons of urban–rural mortality reflect this migration pattern.

Sampling and taphonomic issues might also bias our results. In terms of sampling, at Providence only 24% of the cemetery was excavated, as part of an expansion of the Memphis airport. Other sites were also partly excavated: at Freedman's, 24% of the burials were disinterred; at Elko Switch, about 35%; at Cedar Grove, approximately 63%; and at Ridley, 75%. The percentage of unexcavated Foster burials was not reported. These partial excavations could have a large impact if children were buried in separate areas. In most of these cemeteries, however, children were located amidst adult interments, probably in family groupings (e.g., Oster et al. 2005:38–39; Shogren et al. 1989:225). The exception is the Ridley Graveyard, where discrete clusters of children were buried (Buchner et al. 1999:201). Skeletal

preservation was also a problem, and we were cautious regarding possible preservation bias in the representation of children, women, and the elderly (Walker et al. 1988). This was especially an issue for Foster Cemetery, where 96 of 223 burials had no ($n = 73$) or very poorly preserved ($n = 23$) skeletal remains; the researchers did not estimate age by coffin size there. Poor skeletal preservation was also observed for the Ridley Graveyard and Elko Switch.

With regard to reporting, it was difficult to compare qualitative observations of pathologies and the methods used for age assessment across the site reports. For Freedman's and Cedar Grove, stress markers were reported using the Western Hemisphere Data Coding Scheme, which standardized the data (Goodman and Martin 2002). Reporting for other sites used slight/mild, moderate, and severe or alternative descriptions. For the purposes of intersite comparison of skeletal pathologies, we generally relied on a criterion of presence or absence. Because population demography is central to our analyses, the methods that researchers used to estimate age are important. At Freedman's, Cedar Grove, and Providence (Condon et al. 1998:xiv; Oster et al. 2005; Rose 1985), researchers used an array of techniques. For subadults, these included analysis of dental eruption and calcification, growth of long bones, epiphyseal unions, and endocranial suture closures. For adults, changes to the pubic symphyses and articular surfaces of the ilia were measured, as well the deterioration of sternal rib ends and dental wear. This same battery of techniques was cited for Foster (Thompson 2009:34–38), although only a subset may have been used in some cases because of poor skeletal preservation. For Ridley, researchers were able to determine sex and age for 47 individuals (Buchner et al. 1999:211–216), yet were not specific on the methods used, stating that "metric and nonmetric observations gathered from the preserved portions of the skeletons were used to determine sex, age, stature, genetic affinity, and pathologic condition" (Buchner et al. 1999:212). Likewise, for Elko Switch, the report does not specify the dental and skeletal criteria used to arrive at age estimates (Shogren et al. 1989:37–88, 196, 192). In the absence of human remains, the estimated ages for subadults buried at Ridley ($n = 2$), Providence ($n = 3$), Elko Switch ($n = 20$), and Freedman's ($n = 53$) were based on the size of the grave shaft, coffin remains, or both, a technique often used by bioarchaeologists working on historic cemetery populations (Condon et al. 1998:67; Jantz and Wilson 2005:Appendix 1, 89–94; Shogren et al. 1989:191–196). Individuals who could only be placed in categories of longer than 10 years were not used in our demographic estimates. Still, the lack of specifics for age assessment methods for Elko and Ridley raises the possibility that our observed differences for age-at-death are due in part to the use of different techniques to assess age.

Biological sex (based on pelvic and cranial traits) was assessed using methods that are now called into question because of how they assume a male–female binary and conflate sex and gender (Geller 2008). More recent sex assessment approaches in feminist bioarchaeology decouple sex and gender, problematize sex and gender categories, and refrain from imposing preconceived ideas about social difference onto the past (Agarwal and Wesp 2017). This literature emphasizes that data organized by binary sex do not fully capture the embodied experiences of people that are reflected in the skeletal record (Zuckerman and Crandall 2019). There is the possibility, for example, that an individual's gender presentation may conflict with the assigned sex. Although space does not permit elaboration on these issues, these positions inform our use of the terms "men/women" in place of "males/females" in this article. This usage aligns with how African Americans were socialized into dichotomous gender roles that are documented in the historical record. Further, it allows us to address the health-related consequences of being interpellated by others as raced and gendered persons.

Finally, the "osteological paradox" is relevant to this research (Wood et al. 1992). Skeletal pathologies related to chronic stress take time to develop and are often found among people who survived illness, malnutrition, or both. In contrast, the diseases that led to rapid death usually leave no skeletal traces. Thus, the mortality and longevity data proved instrumental in interpreting quality of life, because there were instances in which the evidence for pathologies alone

might have suggested that health conditions were better than they actually were.

Historical Context

A biocultural approach to interpreting the past considers how biology and culture interrelate. Blakey (2001:409) explains that such an approach "combines cultural and social formation with the demography and epidemiology of archaeological populations to verify, augment, or critique the socioeconomic conditions and processes experienced by past human communities." It follows that a biocultural framework hinges on interpreting human remains by careful consideration of their historical context (Geller 2008:128), which we discuss next. Further insights into work, diet, living conditions, and the disease environment are provided as our interpretations unfold.

Agricultural Lifeways in the Rural South

Our rural populations were composed mostly of tenant farmers and sharecroppers. Emancipation introduced new labor relations between landowning whites and freedmen that prevailed well into the twentieth century. Few blacks were able to purchase land (Hersey 2010:135); the majority were stuck on the lower rungs of a farming hierarchy known as the "agricultural ladder" where they labored under contract (Figure 4; Alston and Kauffman 1998:266–268; Burton 1998:221–222, 224; Hersey 2010:136). African Americans were exploited by the crop lien system in which landowners provided seed and tools; in turn, farmers promised more of their harvest as repayment. Faced with high interest rates, black farmers rarely retained much of their crop. Further, merchants and plantation owners (often one and the same) operated stores and sold food to agricultural workers at inflated prices (Dirks 2016:50).

The transition in labor arrangements also led to changes across the plantation landscape. With tenancy and sharecropping, plantation owners broke up large swathes of land into plots. Families abandoned the former slave quarters and resettled on the plots they worked (Penningroth 2003:81–82). This dispersed settlement pattern retained the social dynamic that African Americans were familiar with, as kin-related households resided in small enclaves

Figure 4. Children of a sharecropping family in Montgomery County, Alabama, 1937 (photo courtesy of Library of Congress [Digital ID fsa 8b35934]).

(Elman et al. 2015). Importantly, under freedom, parents claimed the labor of their children, who played important roles in farming and in the household economy (Jones 2009:84).

Several observations have implications for our interpretations of the evidence. First, tenants and sharecroppers struggled to maintain the balance between producing cash crops and raising their own food (Wilkison 2008). The skeletal pathologies indicate that farmers had varied levels of success with household production in their attempts to meet landowners' demands for cotton planting. Second, the low population density of farmsteads proved to be important in reducing exposure to infectious diseases and leading to greater longevity among farmers. Third, rural families tended to be large, because children contributed to agricultural work (Elman et al. 2015). Spreading the labor among family members helps explain the rural–urban disparity in osteoarthritis discussed later.

African Americans in Dallas

For African Americans who sought to escape from farming, migration to cities proved the rule. In Dallas, they encountered job insecurity, poor living conditions and sanitation, and exposure to infectious diseases. Bioarchaeological studies of urban populations demonstrate how these factors, when combined with rapid population growth, led to high mortality rates and skeletal pathologies related to chronic stress (Buzon et al. 2005; Grauer et al. 2016).

Founded in 1841, Dallas was a small agricultural town that witnessed an increase in its black population right after the Civil War. Freedmen arrived seeking lost family members and refuge from sharecropping. In 1869, they established Freedman's Town and its cemetery (Davidson 2004). The arrival of railways in the 1870s spurred the city's growth and economy, and other black enclaves soon emerged. Most African Americans held low-wage, unskilled, or semiskilled jobs (Engerrand 1978:208). Men were mainly general laborers, porters, and teamsters, whereas women worked as domestics and laundresses (Davidson et al. 2002:260). Many black men were underemployed, which led to high numbers of their spouses entering the workforce (Engerrand 1978:207; Jones 2009:103–105).

By the turn of the century, Dallas was home to more than 42,000 people and still growing. The *Dallas Morning News* published articles on housing for the poor, which lacked "sanitary facilities, adequate privacy, or sunlight and air" (Fairbanks 2014:39). Most homes did not have running water, and outdoor, open privies were the norm. Poor Dallasites lived in small dwellings that were crowded together, leading to densely packed neighborhoods. These dire circumstances were largely the plight of African Americans (Galveston-Dallas News 1911:20–21).

With abolition and the Reconstruction Amendments, white southerners grew fearful that blacks' political gains would diminish white supremacy. Thus, by the 1890s, southern states began to codify segregation through Jim Crow legislation. Further buttressed by the Supreme Court's 1896 decision in *Plessy v. Ferguson*, Jim Crow laws enforced racial discrimination in all manner of public places, including schools and restaurants. Hospitals were also segregated, and some refused to treat black patients altogether (Litwack 1998:233; Prather et al. 2016:667). City ordinances and an "informal code of exclusion and discrimination" ensured that blacks of every class had no choice but to live in majority-black enclaves under abject living conditions (Litwack 1998:229, 235, 336–337). In urban and rural areas, the racial hierarchy was maintained by discriminatory hiring practices and by whites who refused to sell farmland to blacks. The inability to move up the agricultural ladder or secure decent jobs, poor housing conditions, and poor sanitation was implicated in African Americans' morbidity and mortality (Prather et al. 2016:667).

Adult Mortality and the Urban Penalty

Although this article focuses on African Americans, it is important to emphasize that there were significant racial disparities in mortality for our study period. In general, blacks died at younger ages than whites, and the U.S. mortality statistics underscore this point (e.g., Glover 1921). In 1899–1900, 34% of blacks versus 30% of whites died before age five (U.S. Census Bureau 1901). In 1900, 67% of blacks died by

Table 3. Demographic Statistics for Urban and Rural Sites by Sex and Age.

	N	Urban[a]	*N*	Rural[a]
Deaths under age 1	313/1,156	27.1%	56/373	15.0%
Deaths under age 5	438/1,156	37.9%	117/373	31.4%
Deaths under age 15	491/1,156	42.5%	163/373	43.7%
Sex ratio (% female)	241/480	50.2%	94/180	52.2%
Older than 50				
All adults	29/447	6.5%	53/159	33.3%
Female	9/227	3.9%	26/86	30.2%
Male	20/223	9.0%	27/77	35.0%
Average age-at -death				
All adults	447	34.6 years	159	40.8 years
Female	226	32.9	83	41.0
Male	221	39.3	76	43.3

[a]Percentage of individuals out of total number of urban or rural individuals where age assessment (for subadults) or age and sex assessments (for adults) was possible.

age 30 versus 49% of whites. For all Americans, infant mortality was high, but black mortality peaked again for ages 20–30 (Figure 5). More whites died in their sixties and seventies, simply because more lived to that age. In 1900, life expectancy at birth was about 49 years for whites compared to 34 years for African Americans (Arias and Xu 2018:Table 21).

With regard to our data, Dallas men and women interred at Freedman's Cemetery had lower mean ages-at-death and less longevity than their rural counterparts (Table 3). These Dallasites had high mortality between the ages of 25 and 40, and few lived beyond the age of 50 (Figure 6). The average age-at-death for Dallas adults was 34.6 years, compared to 40.8 for rural adults (Table 3), and this disparity holds across time. We compared the mean age-at-death for 170 rural adults ($M = 40.8$, $SD = 14.2$) with that of 565 urban adults ($M = 34.6$, $SD = 9.3$) using a two sample *t*-test and found the difference to be statistically significant: $t(215.2) = -5.3$, $p = 0.0001$. This difference in mean age, however, does not capture the

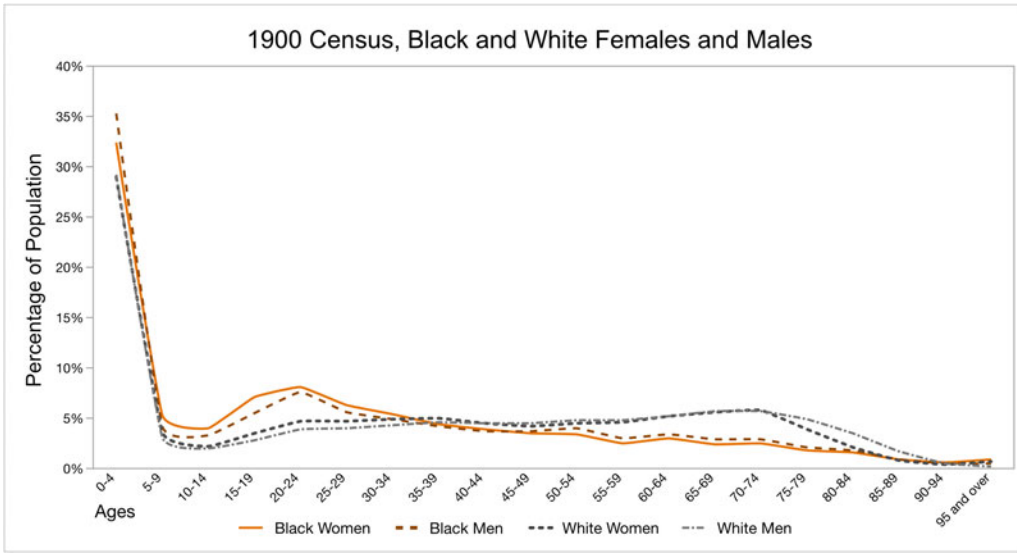

Figure 5. U.S. census mortality profiles for 1900 by race, sex, and age-at-death cohorts.

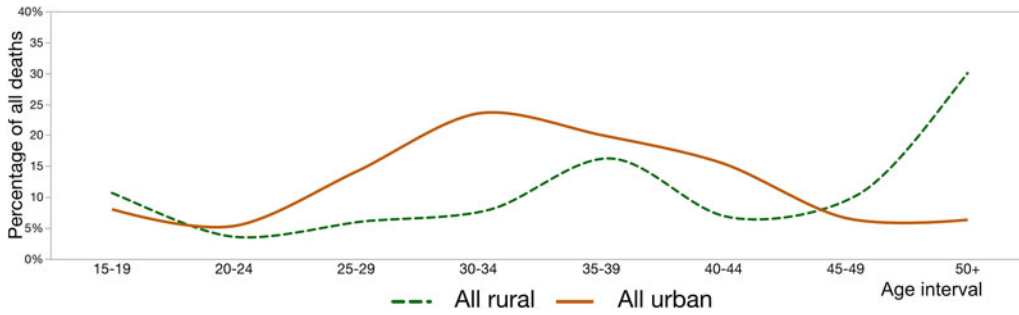

Figure 6. Urban and rural adult mortality profiles with age-at-death for each age interval as a percentage of all deaths.

considerable mortality disparities between these populations. That is, the mean does not reflect that the modal or peak age-at-death for adults in Dallas was 30–34, whereas for rural inhabitants it was age 50+ (Figure 6; a K-S test indicates that the distributions of age-at-death for rural and urban adults are significantly different: $D[732] = 0.122$, $p = 0.0001$).

This rural–urban disparity relates to the urban penalty (Feigenbaum et al. 2019; Maeda 2018; Preston and Haines 1991). Haines (2001:1–2) asserts that crowding, contagious diseases, polluted water and inadequate sewerage, and an influx of migrants newly exposed to the urban disease environment contributed to the "excess mortality of cities." African Americans were disproportionately affected by the urban penalty (Costa and Kahn 2015). In her biocultural study of white and black males born during the late nineteenth century and who died in three U.S. cities, de la Cova (2011) found significant health disparities between these two groups. African Americans suffered from much higher rates of tuberculosis and treponemal disease. Because both these black and white men were indigent and unskilled laborers, socioeconomic status alone could not account for these disparities. Instead, the mostly southern-born blacks in her sample faced racial discrimination in migrating to northern cities that confined them to crowded tenements in areas with poor sanitation.

Tuberculosis was indeed a major cause of death among blacks (Thompson 2017). In addition, typhoid fever and diarrheal diseases caused nearly half of the deaths in cities related to infectious diseases (Cutler and Miller 2005:1–2). These were spread by contaminated drinking water and poor sanitation; in the warmer South wherever open privies dominated, such as in Dallas, fly-transmitted infections were common (Troesken 2004:18). Effective public health measures were implemented in the twentieth century at a time when less than half of households had filtered water and even fewer had sewer lines (Haines 2001:12–13). A large portion of Dallas's drinking water came from the Trinity River, referred to as the "mythological river of death," given its link to typhoid fever cases and contamination from slaughterhouses (Trinity River Authority of Texas 2019; U.S. Department of Commerce 1916:42, 146). Dallas did not adequately treat its water supply until 1914, yet many black Dallasites still lacked running water by 1925 (Fairbanks 2014:39; U.S. Department of Commerce 1916:43, 45, 146, 156).

Dallas's population experienced epidemics that might have affected our mortality data, including outbreaks of smallpox in 1882 and 1889 and of cholera and scarlet fever in 1892 (City of Dallas Health Department 1870–1975). Census records from 1880 to 1920 record the continuous impact of these diseases, along with typhoid fever, influenza, and malaria (U.S. Census Bureau 1881, 1891 1901, 1921). For children, diarrheal diseases such as cholera infantum, dysentery, enteritis, and typhoid fever were the deadliest and were responsible for more than half of infant deaths in 1900 (Wilcox 2008).

The low-density, dispersed settlement pattern among farmers mitigated against water contamination and the spread of diseases (Haines 2001:7). Instead, mosquito-borne malaria was endemic in

the rural South until the 1930s (Humphreys 2009). Malaria was strongly associated with rural impoverishment, and all of the rural cemeteries were located in malarial areas. In the United States, 600,000 cases were reported in 1914 (Sledge and Mohler 2013), yet the death rate was low (CDC 2012). Still, persons infected were lethargic, and agricultural productivity slowed as a result (Sledge and Mohler 2013).

African American Childhood Health and Mortality

Assessing children's health status is important for evaluating the health of their communities, because they are more susceptible than adults to disease and malnourishment. Moreover, malnutrition and illness in early life can have cumulative, long-term effects on adult morbidity and longevity (Beauchesne and Argawal 2018). For African Americans, the "wear and tear" of racism also detrimentally affected their health over the course of their lives, a concept referred to as "biological weathering" (Goodman 2016; Kuzawa and Gravlee 2016). Thus, the evidence for childhood stress we present indicates that adults who survived it remained at greater risk for illness and reduced longevity. The data for adult mean age-at-death and longevity, especially for Dallasites (Table 3), support the idea of weathering.

For the six cemetery populations together, 36% of children never lived to age five, compared to 30% for white children (U.S. Census Bureau 1901), supporting the claim that race was the "most important variable in predicting child mortality" (Preston and Haines 1991:209–210). "Size of place" (low- versus high-density areas) is cited as the second important factor for predicting child mortality (Preston and Haines 1991:174, 210). Yet, when the data for stress and child mortality are compared over time and by site, a more complex narrative of children's well-being emerges.

There are two patterns in Figure 7. First, there are very similar urban–rural mortality rates for the early and middle periods, during which half of those interred were under the age of five. Second, for the late period, mortality rates varied for rural children, with rates in Ridley and Cedar Grove surpassing that of Freedman's. Thus, rural childhood conditions were not altogether healthy. We also note that taphonomic issues meant that 57% of the Foster burials were excluded, leading to a potential underrepresentation of children. The variations in rural child mortality are also evident in the markers for childhood chronic stress.

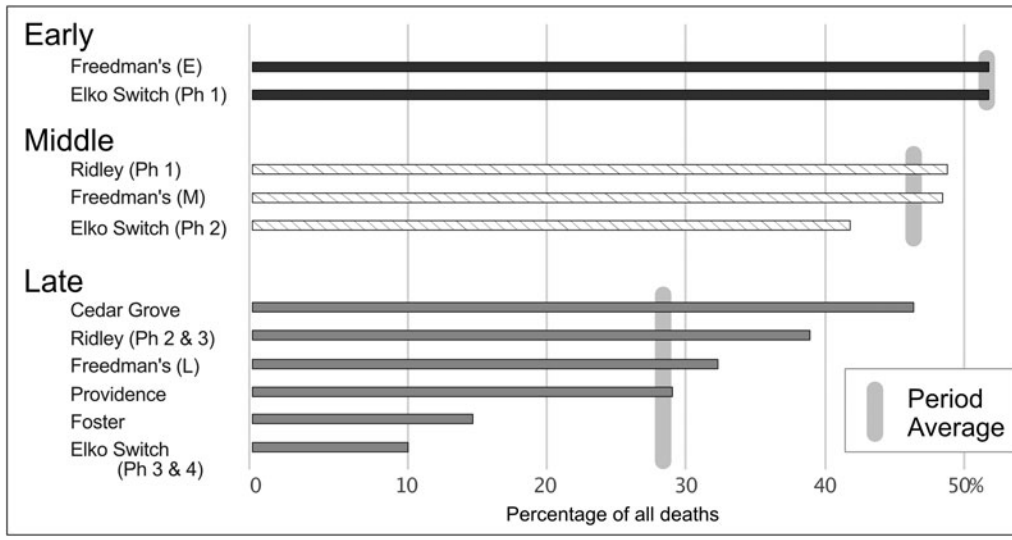

Figure 7. Child mortality (under the age of five) by time period and site.

Linear Enamel Hypoplasia and Early Life Stress

We consider the data for linear enamel hypoplasia (LEH), a nonspecific indicator of stress, to help explain the findings related to child mortality. Enamel hypoplasia refer to enamel defects that appear as grooves across the surface of teeth, indicating periods when enamel formation was disrupted by disease or malnutrition (Blakey et al. 1994). When this defect is present in the permanent incisors and canines, it points to stress between the ages of six months to six years (Goodman and Armelagos 1985; White and Folkens 2005). There are two observations for the LEH data: an increase in the rate of hypoplastic teeth for both urban and rural children over time and, for the late period, variations among rural populations in this pathology (Table 4).

Dallas children experienced chronic stress across all three time periods, and the frequencies of hypoplastic teeth rose before 1900. For Elko Switch, enamel defect frequencies also increased over time. As the percentages of affected individuals rose, child mortality declined (Figure 7). This is likely an effect of the osteological paradox, with more children surviving stress to exhibit enamel hypoplasia. In the earlier period, children likely died from acute illnesses, malnutrition, or both before their permanent teeth erupted or enamel defects could form. For the late period, the different rates of hypoplastic teeth among rural inhabitants suggest variations in diet and environmental stress across these rural communities. Individuals interred at Cedar Grove, in particular, exhibited very high frequencies of enamel defects that implicate poor childhood conditions. Importantly, when considered by site, the child mortality rates and the LEH data do not suggest that the countryside was altogether healthier for children than the city.

Table 4. Enamel Hypoplasia (One or More Hypoplastic Teeth) by Period and Site.

	Incisor		Canine	
	N^a	%[b]	N^a	%[b]
Early				
Freedman's (E)	25	12.0	29	48.3
Elko S. (Ph 1)	6	0.0	5	0.0
Middle				
Freedman's (M)	71	28.2	71	60.6
Elko S. (Ph 2)	12	33.3	12	16.7
Ridley (Ph 1)	3	33.3	3	0.0
Late				
Cedar Grove	40	80.0	42	83.3
Freedman's (L)	471	26.1	486	60.9
Elko S. (Ph 3)	6	50.0	6	66.7
Ridley (Ph 2&3)	17	24.0	17	24.0
Providence	34	14.7	38	31.6
Foster	101	2.0	101	4.0

Note: Based on permanent dentition: maxillary or mandibular incisor or canine.
[a]Sample size.
[b]Expressed as percentage of individuals for whom this condition could be observed.

Wide-scale public health measures were not implemented in Dallas until after Freedman's Cemetery closed. Thus, the decline in child mortality might be attributed to greater community stability toward the end of the century. For instance, churches, mutual aid societies, and fraternal lodges emerged in Freedman's Town (Peter et al. 2000) that helped residents weather conditions associated with impoverishment. Black doctors began to practice in Dallas during the 1890s (Davidson et al. 2002:272). Thus, African Americans made progress in instituting "cultural buffers" (Rankin-Hill 2016:144–145) that probably had positive impacts on children's health. In rural areas, blacks continued to reside on familiar lands and lived in close proximity to extended family members and friends. Both factors would have alleviated some stress. Moreover, the midwives and mothers who routinely provided care work to community members, often relying on traditional medicinal practices, could have made a difference in improving child survival rates (Collins 2000; Wilkie 2003).

In general, Dallas children suffered from chronic illness, poor diet, or both over time, and there were rural conditions that were just as detrimental to children's well-being. We delve further into the health disparities between rural communities next.

Porotic Hyperostosis and Cribra Orbitalia

Porotic hyperostosis (PH) is a pathological condition that presents as porous lesions in the cranial vault; when evident in the orbital roof, it is called cribra orbitalia (CO; Brickley 2018:897). Porotic hyperostosis has different causes, including malnutrition, trauma, parasites, hemolytic anemias, and infectious diseases.

The conventional explanation is that these lesions are the result of hemolytic or acquired iron-deficiency anemia (Blom et al. 2005; Brickley 2018). Walker and colleagues (2009:116), however, question iron-deficiency anemia as an etiology for PH and CO, stating that it fails to "stimulate the massive marrow hypertrophy necessary to produce these lesions" (but see Oxenham and Cavill 2010). Instead, they propose that megaloblastic anemia (dietary deficiencies and malabsorption of vitamin B_{12}, folate, or both) is a proximate cause for PH (Walker et al. 2009:112). The authors further suggest that megaloblastic anemia and scurvy (vitamin C deficiency) in particular, but also rickets and physical trauma, can result in the orbital porosities identified as CO (Walker et al. 2009:115). The manifestations of CO and PH occur during childhood; in adults these lesions are usually healed (Blom et al. 2005:153; Brickley 2018). We introduce the data first and, for this study, note that CO and PH evince detrimental impacts on health that included anemia.

The data for CO and PH are presented in Table 5 (see Supplemental Table 1 for data by age-at-death). Only Freedman's Cemetery had large enough samples for the early and middle periods; thus, Elko Switch and the Ridley Graveyard are excluded. For Freedman's, the individuals initially affected with CO and PH were interred during the middle period; by the late period, a greater percentage of individuals were affected. For the rural samples, there are significant variations. Cedar Grove once again stands out with the highest CO and PH frequencies, whereas there are relatively few individuals affected in Providence and Foster. The synergistic effect of multiple factors is usually cited for PH and CO, and we consider diet, parasites, and disease (e.g., Blom et al. 2005).

The crop lien system and dietary differences are partially implicated in the variations of CO and PH among rural inhabitants. Landowners controlled the terms of the contracts signed with sharecroppers and often forbade them to raise livestock, an important source of vitamin

Table 5. Frequencies of Cribra Orbitalia and Porotic Hyperostosis.

		Cribra Orbitalia			Porotic Hyperostosis		
		Total	*N* affected	%[a]	Total	*N* affected	%[a]
Early Period							
Freedman's	Male	7	0	0.0	11	0	0.0
	Female	6	0	0.0	10	0	0.0
	Subadult	4	0	0.0	16	0	0.0
Middle Period							
Freedman's	Male	13	0	0.0	31	0	0.0
	Female	12	0	0.0	29	1	3.4
	Subadult	13	2	15.4	23	1	4.3
	Indet. adult	—	—	—	3	0	0.0
Late Period							
Cedar Grove	Male	14	3	21.4	14	5	35.7
	Female	21	1	4.8	21	5	23.8
	Subadult	42	18	42.9	43	6	14.0
Freedman's	Male	90	10	11.1	176	9	5.1
	Female	75	9	12.0	176	20	11.4
	Subadult	38	13	34.2	79	2	2.5
	Indet. adult	8	2	25.0	28	4	14.3
Providence	Male	20	2	10.0	20	0	0.0
	Female	16	0	0.0	16	0	0.0
	Subadult	12	2	16.6	12	1	8.3
Foster	Male	29	0	0.0	29	0	0.0
	Female	20	0	0.0	20	1	5.0
	Subadult	45	0	0.0	45	0	0.0
	Indet. adult	33	0	0.0	33	0	0.0

[a]Percentage of all measurable individuals in specified sex or age class.

B_{12} and iron. Grazing livestock on arable land reduced the amount of cash crops that could be grown; for example, the 1865 contract signed by Cedar Grove freedmen prohibited livestock raising (Watkins 1985:12). Most sharecroppers owned only a few hogs, and fresh pork was not a dietary staple (Dirks and Duran 2001:1882). Instead, impoverished southerners subsisted on pork fatback, molasses, and cornmeal, usually purchased on credit (Dirks 2016; Vanderpool and Turner 2013).

Although these foods are high in calories, sharecroppers often struggled to put food on the table (Ferris 2012:9). Moreover, although molasses is high in iron, a reliance on cornmeal was linked to pellagra, a common disease among poor southerners. Pellagra is caused by niacin deficiency and can result in diarrhea, dementia, and, in extreme cases, death. Incidence of the disease peaked in 1928, with 230,000 cases reported in the South (Clay et al. 2019:32). According to her death record, Bell Cunningham, aged 26, died of pellagra and was interred at the Ridley Graveyard (Buchner 1999:Appendix B). Significantly, in cotton-growing regions, African Americans' consumption of animal products decreased by half during the fall and winter, when income from farming ceased and food supplies were depleted (Dirks 2016:90–92). Eggs, a key source of iron, vitamin B_{12}, and folate, also became scarce then. This annual pattern of food insecurity is tied to plantation tenancy and may have been experienced by Cedar Grove residents.

The low frequencies of CO and PH among individuals interred at Providence and Foster cemeteries suggest that they resided in communities with more successful household economies. As during slavery, African Americans after emancipation relied on a range of subsistence strategies to diversify and supplement their core diet of fatback, cornmeal, and molasses. Archaeological research has demonstrated that southern blacks fished and hunted wild game (Holland 1990; Tuma 2006). Faunal remains associated with tenant farmers at Alma and Riverlake plantations in Louisiana confirm their consumption of fish, chicken, domestic turkey, duck, rabbit, and opossum (Palmer 2005:233–237)—all good sources of protein, iron, and vitamin B_{12}. Plant-based foods, including leafy greens, provided folate and additional iron to the diet. Tenants who were able to keep a garden (many could not; Ferris 2012) typically raised collard or turnip greens, although they were only available in season.

If, as we suggest here, Cedar Grove residents experienced recurring food insecurity, a combination of malnutrition, diseases, and parasites would have elevated the risk of developing anemia, especially among the more vulnerable young. Malaria and hookworm infection can result in severe anemia, and both were endemic in the rural South. Researchers have demonstrated a link between malaria and CO and PH in archaeological populations (Gowland and Western 2012). Both Cedar Grove and Providence cemeteries were located in counties at especially high risk for malaria (Hong 2007). The hookworm is a parasite associated with poor sanitation, and most farmers used chamber pots or the outdoors (Ayers 2007:210; Wilkie 2003:187–188). Because impoverished children in rural areas often went barefoot, they were prone to hookworm infection (Humphreys 2009:1739).

Turning to Freedman's Cemetery, research on free blacks interred at Philadelphia's First African Baptist Church (FABC) cemetery (1822–1843) illustrates how city living elevated African Americans' risk of illness and death (Rankin-Hill 2016:144). Although this population was generally healthier than other blacks, the FABC skeletal series exhibited three patterns associated with African diasporic populations: high child mortality rates, episodes of malnourishment and infectious diseases, and high frequencies of osteoarthritis (Rankin-Hill 2016:150). Racial segregation, rapid population growth, and substandard housing led to elevated chronic stress, as evinced by the porotic hyperostosis and hypoplastic enamel defects among individuals interred at the FABC cemetery.

The historical and bioarchaeological evidence for Freedman's Cemetery suggests similarities in conditions between this population and that interred at the FABC cemetery.

There was no evidence for CO and PH for the early period; frequencies of both sharply increased over time (Table 5); for CO, $X^2(247) = 5.41$, $p = 0.02$; for PH $X^2(545) = 4.06$, $p = 0.04$). This

trend correlates with the city's rapid growth (Davidson et al. 2002). From 1880 to 1910, the population increased from 10,000 to 92,000. Although child mortality rates declined, blacks increasingly lived in higher-density neighborhoods and experienced worse living conditions. Their lack of filtered water and sanitary facilities and the prevalence of livestock roaming city streets meant greater exposure to diseases and parasites (Davidson et al. 2002:251; Fairbanks 2014). These conditions alone would lead to increased bouts of severe anemia, particularly among the young. Yet, impoverishment and the inability to raise food or hunt in the city meant that black Dallasites were also prone to malnourishment.

The data for CO reveal a shared pattern of poor maternal health, weaning practices, and gastrointestinal infections across the rural–urban divide. For Cedar Grove children between the ages of zero to three years, half (16 of 31) were affected with CO, whereas for post-1900 Freedman's, 30% (8 of 26) of children in this age group were affected (Supplemental Table 1). Bioarchaeologists have demonstrated how malnourishment in mothers not only compromised the health of the developing fetus but also infants nursed on breastmilk with low levels of vitamins B_{12} and C could develop megaloblastic anemia and scurvy (Newman and Gowland 2017:226; Walker et al. 2009). Further, diarrheal diseases such as cholera infantum and dysentery were major causes of death among infants. Acute gastroenteritis can reduce the absorption of vitamin B_{12} (Walker et al. 2009:115). During and after slavery, infants as young as four months were introduced to table foods (Blakey et al. 1994; Ewbank 1987:117–118; Kiple and Kiple 1977). These foods were mainly starchy paps made with fat, cornmeal, or hominy and mixed with water or milk (Steckel 1995:1924). These high-carbohydrate, low-protein weaning foods have been linked to scurvy, rickets, and anemias (Kiple and Kiple 1977; Vanderpool and Turner 2013). Foods mixed with contaminated water or milk would cause diarrheal diseases. In Dallas, by 1907, the city's inspection of milk and dairies did not include testing for bacteria, and spoiled milk was a prime source of bacterial infections (Ewbank 1987:117–118; Grauer et al. 2016:212; McMillen 1985:342; U.S. Census Bureau 1910). Thus, the health of mothers and of young children interred at Cedar Grove and Freedmen's was compromised by malnourishment, poor sanitation, and diarrheal diseases (e.g., Walker et al. 2009:118).

Using multiple lines of evidence, we arrived at several findings. First, there were rural conditions that were as detrimental to children's health as city living. This is supported by the data for stress and child mortality for Elko Switch, Ridley, and Cedar Grove. For rural children, variations in health and mortality rates were likely due to differences in diet, sanitation, and exposure to parasites and diseases. Although some of these rural samples are relatively small, comparing the data by site rather than as an aggregate proved essential in elucidating these variations. Finally, for those who survived to adulthood, Dallas men and women were at higher risk than their rural counterparts for midlife mortality and reduced longevity (Table 3). Thus, biological weathering and chronic stress in early life had a more adverse impact on Dallasites, especially when combined with their continued residence in the city, than on farmers.

Labor and Joint Disease

We compared the data for joint disease to discern whether urbanites and rural farmers differed in terms of work-related stress. Although a common approach is to reconstruct past activity patterns by assessing mechanical loading and repetitive tasks and their effects on different joint complexes (e.g., hip–knee), this line of inquiry is beyond the scope of this article. Instead, we considered the presence of moderate to severe osteoarthritis (OA). Because individuals become more prone to osteoarthritis as they age (Watkins 2012), we also determined the mean ages of those affected. If work-related stress was similar for both groups, we predicted that rural inhabitants would have higher OA frequencies, because they began farming at an early age and they lived longer.

In only the cases with more advanced joint disease (moderate to severe), Providence and Cedar Grove women had double the rate of OA than Dallas women, whereas none of the

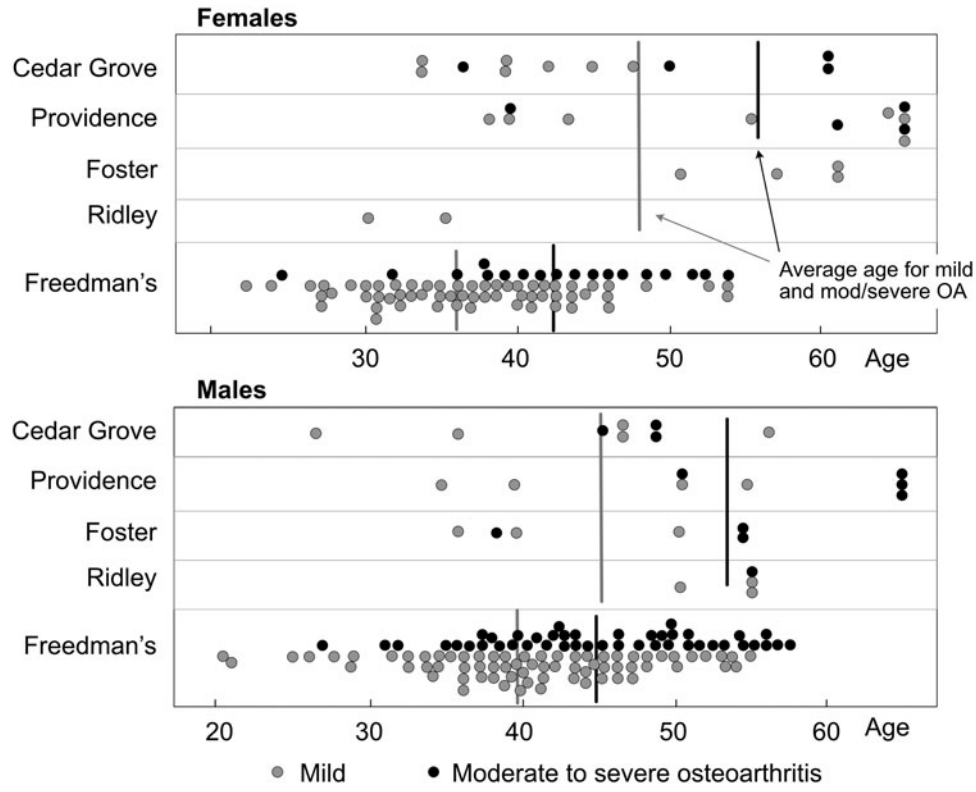

Figure 8. Osteoarthritis by sex, age-at-death, and site. Each circle represents an individual affected with joint disease.

women interred in Foster and Ridley had advanced joint disease (Figure 8; Supplemental Table 2). Both rural and urban men exhibited moderate to severe OA, with the highest frequency (by a small margin) observed for Freedman's. What is more telling is the mean ages of those affected. Dallas men and women developed moderate to severe joint disease by their mid-forties, compared to rural men and women who were 50+ years old. The results are somewhat unexpected, because sharecroppers began farming as young as age seven (Wilkison 2008:56). In certain instances, there is an elevated risk of developing OA when work-related stress is high, and it begins early in life (Weiss and Jurmain 2007:444). Thus, farming has been implicated in higher rates of OA, especially of the hips, in comparison to other occupations.

Research on farmers found an elevated risk of hip OA that increased the longer they farmed (Thelin et al. 1997). Men who began heavy manual labor in their teens also had greater risks of developing OA (Croft et al. 1992:1271; Thelin et al. 1997). That Dallas adults had similar or higher rates of OA and at younger mean ages points to greater work-related stress. Further, despite the relationship between farming and hip OA, adults interred at Freedman's surpassed Cedar Grove adults in the frequencies of hip and knee OA (Davidson et al. 2002:255). This rural–urban disparity in joint disease is likely due to the nature of sharecropping, which, although arduous and beginning at an early age, was seasonal, and the work was more self-paced after emancipation (Davidson et al. 2002:265). In addition, because sharecroppers worked as families, most chores were shared.

Labor, Reproduction, and Black Maternal Health

African Americans' morbidity and mortality differed by place, age, and also gender. Figure 9 shows that women died at younger

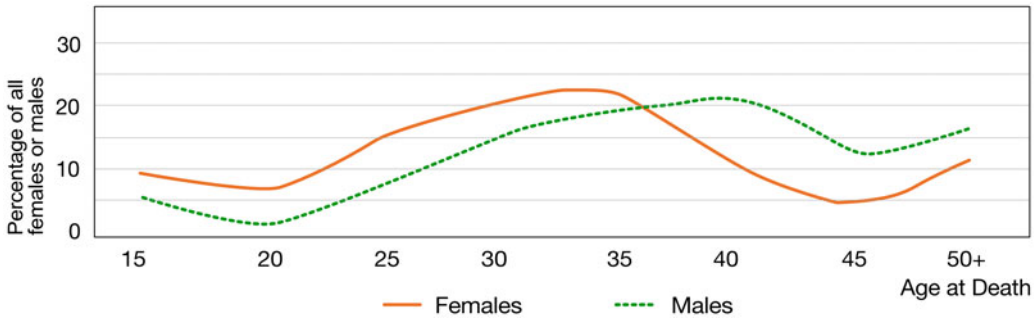

Figure 9. Mortality profiles for adult females versus males. The mortality distribution for females was significantly different from that of males (KS test, D[606] = 0.27, p = 0.0001).

ages and at higher numbers than men. For adults who survived childhood, nearly half of the men lived past 40 compared to only 26% of women. Over time, men consistently outlived women in both rural and urban contexts (Figure 10). In this section, we consider how gender and racial oppression led to differential experiences for black women that adversely affected their health and longevity (Zuckerman and Crandall 2019). More specifically, our focus on black women of reproductive age reveals how childbirth relates to a "larger constellation of problems that put women at risk for high rates of morbidity and mortality" (Stone 2016:151).

Black Women's Working Lives

Pamela Geller (2017:126) argues that the "heteronormative assumptions" surrounding the sexual division of labor (men produce, women reproduce) are "the philosophical bedrock in many bioarchaeological studies." We agree with this critique and note that this gender dichotomy of labor did not apply to the majority of enslaved and free black women (Collins 2000; Rankin-Hill 2016). Black women farmed (Burton

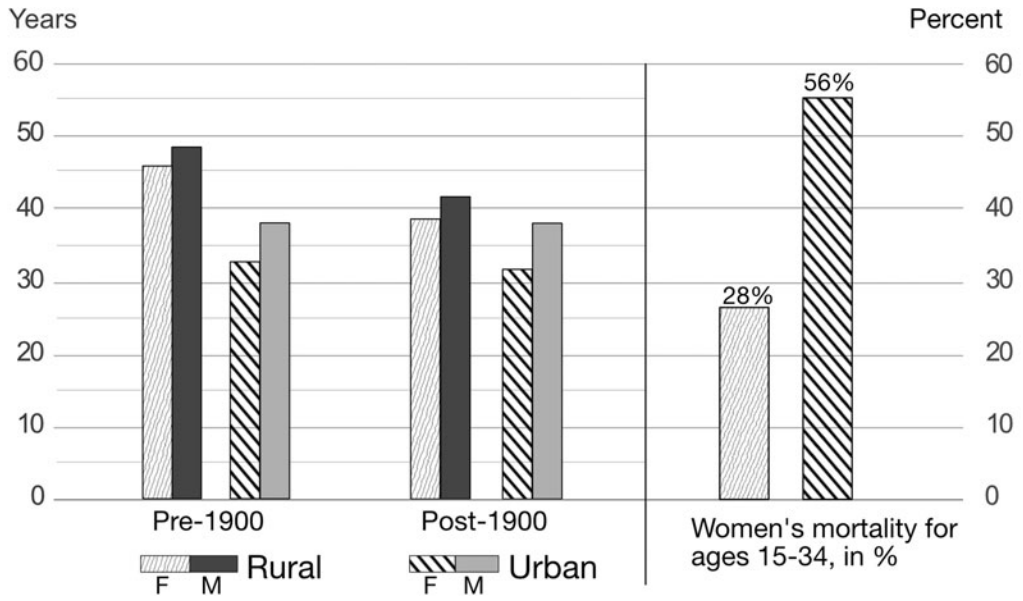

Figure 10. Mean age-at-death for adult males versus females (left), and mortality rates for rural versus urban females (ages 15 to 34 years).

1998), and most urban black women had jobs, either because of their spouse's underemployment or because they headed their own households (Jones 2009:103–105). In the urban South, it was common for black women to raise children on their own (Ayers 2007:69). As early as 1880, about 30% of black households in Dallas were headed by women (Teague and Davidson 2011:93).

Urban black women typically worked as laundresses. Of the black women who worked in Dallas and who were listed in the 1909 city directory, 40% were laundresses (Davidson et al. 2002:260–261). Although the pay was low, this work came with certain advantages (Hunter 1997:57–58; Wilkie 2003:83–84). Laundresses were largely self-employed, and because they often worked from home, laundresses could wash clothes, do their household chores, and raise their children. Yet laundering led to OA of the shoulder and elbow; exposure to contaminated water and dirty laundry meant that laundresses were prone to contracting diseases (Davidson et al. 2002:261; Rankin-Hill 2016:144).

Black women's working lives troubled the private–public gender binary. They worked outside of the home and were essential to their household's economy. In rural areas, their productivity (canning, gardening, selling butter and eggs) alleviated the family's dependence on merchant credit (Ayers 2007:204–205). They shopped, cooked, sewed clothes, cleaned, nursed the sick, and raised children. Black women's labor was physically and emotionally demanding, and these "invisible stressors" are implicated in maternal health (Stone 2016:167).

Black Maternal Morbidity and Mortality

Black women experienced higher rates of maternal morbidity, stillbirths, and deaths than white women (Carson 1994:37; Elman et al. 2015:203). In 1880, about 2.5% of white women versus 4.9% of black women died of "afflictions connected with pregnancy" (U.S. Census Bureau 1881, 11:29), and this disparity continued into the 1930s (Cutright and Shorter 1979:196; Elman et al. 2015:194–195; Loudon 1988:188, 213). From 1910 to 1940, black female mortality exceeded that of males; Ewbank (1987:109) remarked that this atypical pattern of black mortality was "clearly related to problems with childbearing." We posit instead that the broader inequalities experienced by black women were the root causes of maternal mortality, not childbearing in and of itself.

Our contextualization of black maternal health within structural oppression is influenced by a recent biocultural study that considers gendered violence as a root cause of maternal deaths. Pamela Stone (2016) asserts that birth is a natural process, yet women's reproductive bodies have become pathologized in the paleoanthropological literature. Stone argues that it is not childbirth but broader inequalities that compromise maternal health. Although she focuses on the related rise of modern obstetrics, reproductive risk management, and maternal mortality, Stone (2016:162) also considers other "general stressors" that put expectant mothers at risk.

It is unknown how many of the women we studied died of complications related to pregnancy and childbirth. Women's reproductive years are between 15 and 44, with advanced maternal age at 35+ years. Twenty-eight percent of rural women died before the age of 35, and well over half (56%) of the women buried at Freedman's never lived to that age (Figure 10). Even though the age-at-death data on their own are not a reliable measure for maternal mortality, the statistics related to black women's fertility suggest that at least a portion of them succumbed to childbirth complications.

Although fertility rates declined over the late nineteenth and early twentieth centuries (Haines and Steckel 2000; Tolnay 1981), black women still bore more children than whites. In 1900, their total fertility rate (TFR) was about 5.6 children versus 3.5 for whites (Tolnay 1987:213–217). Between 1886 and 1892, rural black women had a much higher TFR (9.2) than urban women (5.3), and rural women had a high TFR until the 1940s (Tolnay 1981:453–454, 1987; Tolnay and Glynn 1994). Thus, not only was sharecropping a form of debt slavery but it was also implicated in rural black women's reproductive burden. Plantation tenancy encouraged childbearing, because larger families fared better odds in securing labor contracts; yet multiple births elevated the risk of maternal death (Elman et al. 2015:202; Leavitt 1986:25–26).

While women interred at Freedman's and Cedar Grove, in particular, survived childhood malnutrition and illness, these early life stressors probably elevated their risks for maternal morbidity and mortality. Relatedly, the data for CO for infants one year of age or younger (Supplemental Table 1) point to poor maternal health. Their nursing mothers were very likely malnourished, a condition they passed on to their infants through nutritionally poor breastmilk (Walker et al. 2009). A lack of access to medical care and nutritious diets meant that black women were likely to succumb to the primary causes cited for maternal deaths. Until the 1930s, puerperal sepsis (postpartum infection) was the main cause of maternal deaths, followed by hemorrhaging and toxemia (preeclampsia; Loudon 1988:193–195). Black women died of infection and toxemia more often than whites (Carson 1994:37; Cutright and Shorter 1979:196). Chronic anemia elevates the risk of hemorrhaging (Loudon 1988:197; Stone 2016:167). The evidence for PH among Freedman's and Cedar Grove females raises the possibility that they struggled with anemia, a condition that is exacerbated by pregnancy, into their childbearing years. African Americans are at a higher risk than whites of developing rickets, which can lead to pelvic deformities that increase the risk of obstructed labor and death (Cutright and Shorter 1979; Stone 2016:155).

We presented one plausible explanation for why women had higher rates of midlife mortality than men, and there are undoubtedly others. Pregnancy and childbirth within the context of racism and gendered violence put black women at risk for an early death. In both cities and rural areas, they assumed strenuous workloads, and expectant mothers continued to work out of necessity. These stressors, combined with impoverishment, all but ensured poor maternal health.

Discussion and Conclusion

After 1865, most African Americans in the South followed two trajectories: they stayed as farmers in the rural areas that they were deeply familiar with or struck out for towns and cities seeking a different way of life. In the countryside, anti-black racism and economic subjugation made it extremely difficult to move out of tenancy and sharecropping, whereas in the cities most African Americans continued to work as low-wage laborers with little job security. Within this historical context, our research addressed the heterogeneity of black experiences based on bioarchaeological evidence. Our comparisons of the data by age, place, and gender helped elucidate how and why health and longevity differed between communities and between men and women. We draw four conclusions from our research: (1) for those who survived to adulthood, urbanites had higher midlife mortality and reduced longevity compared to farmers; (2) urban and rural black children experienced poor health and high mortality; (3) relatedly, there were notable health and mortality disparities between the rural communities; and (4) black maternal health was implicated in the gender disparity in midlife mortality. We discuss each of these conclusions next.

African Americans led precarious lives in cities, including Dallas. The increasing frequencies of hypoplastic teeth, CO, and PH over time were undoubtedly due to the city's population growth, which exacerbated problems with crowding, sanitation, and the spread of diseases. Malnourishment, contaminated weaning foods, and diarrheal diseases are also implicated in the high rate of infant deaths (Table 3) and the CO observed in children three years and younger. Based on the data for osteoarthritis, black Dallasites also experienced a more physically demanding working environment than farmers. Importantly, Dallas men and women died at younger ages than their rural counterparts; far fewer lived to age 50 or older. This suggests that childhood chronic stress, biological weathering, and continued residence in the city elevated the risks of illness and mortality in urban adults.

A focus on childhood stress and mortality by site complicated the urban penalty thesis. Before 1900, the comparable urban–rural mortality rates and frequencies of enamel defects for Elko Switch and Freedman's suggest similarly adverse conditions for children in both settings. After 1900, stress markers and child mortality varied significantly across the rural populations. Compared to Freedman's, individuals interred

at Foster, Ridley, and Providence had lower rates of enamel defects, porotic hyperostosis, or both. At the same time, however, the rate of child mortality in Cedar Grove and Ridley surpassed that in Freedman's. There was also the issue of poor skeletal preservation at rural sites, with a potential underrepresentation of children for Foster Cemetery. Poor preservation also precluded the possibility of including all of the rural samples in the comparisons of LEH, CO, and PH. Yet, based on the evidence at hand, there was greater complexity in childhood health than the urban penalty suggests. Although the countryside was not altogether healthier for children, for those who survived to adulthood, residence in low-density rural areas led to greater longevity and a less stressful working environment than urban living. Finally, rural and urban child mortality declined over time, and we provided possible avenues for future research to explain this pattern.

Cedar Grove, in particular, challenges the notion that black farming communities were a homogeneous group with unvaried lifeways and environmental conditions. This community had more deaths among children and higher frequencies of hypoplastic teeth, CO, and PH than any other community, including Dallas. We posited that dietary differences and greater exposure to disease and parasites may help explain the health disparities between these rural enclaves. Further, as in Freedman's, poor maternal health, diarrheal diseases, and weaning practices were the likely causes of the cribra orbitalia observed in very young children. Of the rural populations we studied, Cedar Grove was anomalous. However, further bioarchaeological research is likely to reveal an even more diverse spectrum of health and mortality outcomes between African American farmers.

Had we just focused on the evidence for physiological stress, we might have proposed that men's quality of life was lower than or similar to that of women. Yet the gender disparity in mortality rates suggests otherwise. We concluded that women's burden of domestic and extra-domestic labor, coupled with the stress of having and rearing children, played a role in elevating their risk of an early death. Compared to white women, black women had poorer maternal health, nearly double the rate of deaths related to childbirth, and much lower life expectancy. Importantly, an emphasis on black women's life experiences underscored how structural inequalities systematically disadvantaged them (Prather et al. 2016).

Bioarchaeological evidence is remarkably sensitive to the role of gender, racial, and economic inequalities in influencing quality of life (Blakey and Rankin-Hill 2016; Buzon 2005; Geller 2017; Grauer et al. 2016; Rankin-Hill 2016; Stone 2016). This avenue of research is relevant in today's society, because it resonates with current concerns regarding health disparities. In the United States, black children have historically suffered from poor health and high mortality rates, and current infant mortality rates for African Americans are twice that of non-Hispanic whites (Hamilton et al. 2013:552–555; Prather et al. 2016:666). Chronic diseases, including cancer, stroke, diabetes, and HIV/AIDS, afflict black Americans at higher rates than they do whites (Noonan et al. 2016). Coronary heart disease (CHD) is the leading cause of death among Americans. Yet, although CHD is less prevalent among blacks than whites, blacks still die more often from it (Leigh et al. 2016:9). Black women's unequal access to health care means they experience higher incidences of pregnancy-related complications and deaths than women of other races (Prather et al. 2016:664). As of this writing, African Americans suffer disproportionately from COVID-19-related deaths than other racial groups. The continuation of these disparities can be traced back to the communities we studied. Using bioarchaeological data, important work remains to be done in historicizing health and inequality to better address racism and how it "gets under the skin" (Goodman 2016).

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Supplemental Table 1. Frequencies of Cribra Orbitalis and Porotic Hyperostosis by Age-at-Death Cohort.

Supplemental Table 2. Frequencies of Osteoarthritis by Sex and Mean Age-at-Death.

References Cited

Agarwal, Sabrina C., and Julie K. Wesp (editors)
2017 *Exploring Sex and Gender in Bioarchaeology*. University of New Mexico Press, Albuquerque.

Alston, Lee J., and Kyle D. Kauffman
1998 Up, down, and off the Agricultural Ladder: New Evidence and Implications of Agricultural Mobility for Blacks in the Postbellum South. *Agricultural History* 72(2):263–279.

Arias, Elizabeth, and Jiaquan Xu
2018 United States Life Tables, 2017. *National Vital Statistics Reports* 68(7):1–65.

Ayers, Edward L.
2007 *The Promise of the New South: Life after Reconstruction*. Oxford University Press, Oxford.

Barnes, Jodi A.
2011 *The Materiality of Freedom: Archaeologies of Post-Emancipation Life*. University of South Carolina Press, Columbia.

Battle-Baptiste, Whitney
2011 *Black Feminist Archaeology*. Left Coast Press, Walnut Creek, California.

Beauchesne, Patrick, and Sabrina C. Agarwal
2018 *Children and Childhood in Bioarchaeology*. University Press of Florida, Gainesville.

Blakey, Michael L.
2001 Bioarchaeology of the African Diaspora in the Americas: Its Origins and Scope. *Annual Review of Anthropology* 30:387–422.

Blakey, Michael L., Teresa E. Leslie, and Joseph P. Reidy
1994 Frequency and Chronological Distribution of Dental Enamel Hypoplasia in Enslaved African Americans: A Test of the Weaning Hypothesis. *American Journal of Physical Anthropology* 95:371–383.

Blakey, Michael L., and Lesley M. Rankin-Hill
2016 Political Economy of African Forced Migration and Enslavement in Colonial New York: An Historical Biology Perspective. In *New Directions in Biocultural Anthropology: Biocultural Approaches to Health and Diet*, edited by Molly K. Zuckerman and Debra L. Martin, pp. 107–132. Wiley & Sons, Hoboken, New Jersey.

Blom, Deborah E., Jane E. Buikstra, Linda Keng, Paula D. Tomczak, Eleanor Shoreman, and Debbie Stevens-Tuttle
2005 Anemia and Childhood Mortality: Latitudinal Patterning along the Coast of Pre-Columbian Peru. *American Journal of Physical Anthropology* 127:152–169.

Brickley, Megan B.
2018 Cribra Orbitalia and Porotic Hyperostosis: A Biological Approach to Diagnosis. *American Journal of Physical Anthropology* 167:896–902.

Buchner, C. Andrew, Emanuel Breitburg, Charles Williams, and Elizabeth A. Williams
1999 *At Rest, Again: The Ridley Graveyard (40WM208) Archaeological Relocation Project, Williamson County, Tennessee*. Panamerican Consultants Inc. Submitted to Gresham Smith and Partners and the Tennessee Department of Transportation, Contract No. 94840120304.

Burton, Orville Vernon
1998 African American Status and Identity in a Postbellum Community: An Analysis of the Manuscript Census Returns. *Agricultural History* 72(2):213–240.

Buzon, Michele R., Phillip L. Walker, Francine Drayer Verhagen, and Susan L. Kerr
2005 Health and Disease in Nineteenth-Century San Francisco: Skeletal Evidence from a Forgotten Cemetery. *Historical Archaeology* 39(2):1–15.

Carson, Carolyn Leonard
1994 And the Results Showed Promise: Physicians, Childbirth, and Southern Black Migrant Women, 1916–1930; Pittsburgh as a Case Study. *Journal of American Ethnic History* 14(1):32–64.

Centers for Disease Control and Prevention
2012 Malaria Morbidity and Mortality 1920–1946. Electronic document, https://www.cdc.gov/malaria/about/history/uscurves.html, accessed September 2, 2019.

City of Dallas Health Department Collection
1870–1975 Register and Researcher's Guide, Texas Archival Resources Online, Dallas Public Library. Electronic document, https://legacy.lib.utexas.edu/taro/dalpub/08212/dpub-08212.html#a0, accessed January 19, 2020.

Clay, Karen, Ethan Schmick, and Werner Troesken
2019 The Rise and Fall of Pellagra in the American South. *Journal of Economic History* 79:32–62.

Collins, Patricia Hill
2000 *Black Feminist Thought: Knowledge, Consciousness, and the Politics of Empowerment*. 2nd ed. Routledge, London.

Condon, Cynthia G., Joy L. Becker, Heather Edgar, James M. Davidson, Juerena Hoffman, Patricia Kalima, Daniel Kysar, Susan Moorehead, Victoria Owens, and Keith Condon
1998 *Freedman's Cemetery: Site 41DL316, Dallas, Texas, Assessments of Sex, Age at Death, Stature and Date of Interment*. Report No. 9. Geo-Marine Inc. Submitted to the Texas Department of Transportation. Copies Available from Geo-Marine, Plano, Texas.

Costa, Dora L., and Matthew E. Kahn
2015 Declining Mortality Inequality within Cities during the Health Transition. *American Economic Review* 105:564–569.

Croft, P., D. Coggon, M. Cruddas, and C. Cooper
1992 Osteoarthritis of the Hip: An Occupational Disease in Farmers. *British Medical Journal* 304:1269–1272.

Cutler, David, and Grant Miller
2005 The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States. *Demography* 42:1–22.

Cutright, P., and E. Shorter
1979 The Effects of Health on the Completed Fertility of Nonwhite and White U.S. Women Born from 1867 through 1935. *Journal of Social History* 13:191–218.

Davidson, James M.
2004 *Mediating Race and Class through the Death Experience: Power Relations and Resistance Strategies*

of an African-American Community, Dallas, Texas (1869–1907). PhD dissertation, Department of Anthropology, University of Texas, Austin.

Davidson, James M., Jerome C. Rose, Myron P. Gutmann, Michael R. Haines, Keith Condon, and Cindy Condon
2002 The Quality of African-American Life in the Old Southwest near the Turn of the Twentieth Century. In *The Backbone of History: Health and Nutrition in the Western Hemisphere*, edited by Richard H. Steckel and Jerome C. Rose, pp. 226–277. Cambridge University Press, Cambridge.

de la Cova, Carlina
2010 Cultural Patterns of Trauma among 19th-Century-Born Males in Cadaver Collections. *American Anthropologist* 112:589–606.
2011 Race, Health, and Disease in 19th-Century-Born Males. *American Journal of Physical Anthropology* 144:526–537.

Dirks, Robert
2016 *Food in the Gilded Age: What Ordinary Americans Ate*. Rowman & Littlefield Publishers, Lanham, Maryland.

Dirks, Robert T., and Nancy Duran
2001 African American Dietary Patterns at the Beginning of the 20th Century. *Journal of Nutrition* 131:1881–1889.

Elman, Cheryl, Andrew S. London, and Robert A. McGuire
2015 Fertility, Economic Development, and Health in the Early Twentieth-Century U.S. South. *Journal of Interdisciplinary History* 46:185–223.

Engerrand, Steven W.
1978 Black and Mulatto Mobility and Stability in Dallas, Texas, 1880–1910. *Phylon* 39:203–215.

Ewbank, Douglas C.
1987 History of Black Mortality and Health before 1940. *Milbank Quarterly* 65:100–128.

Fairbanks, Robert B.
2014 *The War on Slums in the Southwest: Public Housing and Slum Clearance in Texas, Arizona, and New Mexico, 1935–1965*. Temple University Press, Philadelphia.

Feigenbaum, James J., Christopher Muller, and Elizabeth Wrigley-Field
2019 Regional and Racial Inequality in Infectious Disease Mortality in U.S. Cities, 1900–1948. *Demography* 56:1371–1388.

Ferris, Marcie
2012 The Deepest Reality of Life: Southern Sociology, the WPA, and Food in the New South. *Southern Cultures* 18(2):6–31.

Galveston-Dallas News
1911 The Housing Problem in Texas: A Study of Physical Conditions under Which the Other Half Lives. *Galveston-Dallas News*, Dallas.

Geller, Pamela L.
2008 Conceiving Sex: Fomenting a Feminist Bioarchaeology. *Journal of Social Archaeology* 8:113–138.
2017 *The Bioarchaeology of Socio-Sexual Lives: Queering Common Sense about Sex, Gender, and Sexuality*. Springer, Cham, Switzerland.

Glover, James W.
1921 *United States Life Tables, 1890, 1901, 1910, and 1901–1910*. Government Printing Office, Washington, DC.

Goodman, Alan H.
2016 Disease and Dying while Black: How Racism, Not Race, Gets under the Skin. In *New Directions in Biocultural Anthropology: Biocultural Approaches to Health and Diet*, edited by Molly K. Zuckerman and Debra L. Martin, pp. 69–87. Wiley & Sons, Hoboken, New Jersey.

Goodman, Alan H., and George J. Armelagos
1985 The Chronological Distribution of Enamel Hypoplasia in Human Permanent Incisor and Canine Teeth. *Archives of Oral Biology* 30:503–507.

Goodman, Alan H., and Debra L. Martin
2002 Reconstructing Health Profiles from Skeletal Remains. In *The Backbone of History: Health and Nutrition in the Western Hemisphere*, edited by Richard Steckel and Jerome C. Rose, pp. 11–60. Cambridge University Press, Cambridge.

Gowland, Rebecca L., and A. G. Western
2012 Morbidity in the Marshes: Using Spatial Epidemiology to Investigate Skeletal Evidence for Malaria in Anglo-Saxon England (AD 410–1050). *American Journal of Physical Anthropology* 147:301–311.

Grauer, Anne L., Laura A. Williams, and M. Catherine Bird
2016 Life and Death in Nineteenth-Century Peoria, Illinois: Taking a Biocultural Approach towards Understanding the Past. In *New Directions in Biocultural Anthropology: Biocultural Approaches to Health and Diet*, edited by Molly K. Zuckerman and Debra L. Martin, pp. 201–217. Wiley & Sons, Hoboken, New Jersey.

Haines, Michael R.
2001 *The Urban Mortality Transition in the United States, 1800–1940*. Working Paper No. 134. National Bureau of Economic Research, Washington, DC.

Haines, Michael R., and Richard H. Steckel
2000 *A Population History of North America*. Cambridge University Press, Cambridge.

Hamilton, Brady E., Donna L. Hoyert, Joyce A. Martin, Donna M. Strobino, and Bernard Guyer
2013 Annual Summary of Vital Statistics: 2010–2011. *Pediatrics* 131:548–558.

Hersey, Mark D.
2010 "Their Plows Singing beneath the Sandy Loam": African American Agriculture in the Late-Nineteenth-Century South. In *African Americans in the Nineteenth Century: People and Perspectives*, edited by Dixie Ray Haggard, pp. 133–147. ABC-CLIO, Santa Barbara, California.

Holland, Claudia C.
1990 Tenant Farms of the Past, Present, and Future: An Ethnoarchaeological View. *Historical Archaeology* 24(4):60–69.

Hong, Sok Chul
2007 The Burden of Early Exposure to Malaria in the United States, 1850–1860: Malnutrition and Immune Disorders: 1. *Journal of Economic History* 67:1001–1035.

Humphreys, Margaret
2009 How Four Once Common Diseases Were Eliminated from the American South. *Health Affairs* 28:1734–1744.

Hunter, Tera W.
1997 *To 'Joy My Freedom: Southern Black Women's Lives and Labors after the Civil War*. Harvard University Press, Cambridge, Massachusetts.

Jantz, Lee Meadows, and Rebecca J. Wilson
2005 Osteological Analysis of Burials from Providence Baptist Church (40SY619). In *Archaeological and Osteological Investigations of the Providence Baptist Church Cemetery (40SY619), Memphis-Shelby County*

Airport, Memphis, Shelby County, Tennessee, edited by Warren J. Oster, Guy G. Weaver, Jamison P. Richardson, and Jason M. Wyatt, Appendix 1. Copies available from Weaver & Associates, Memphis.

Jones, Jacqueline
2009 *Labor of Love, Labor of Sorrow: Black Women, Work, and the Family, from Slavery to the Present*. Basic Books, New York.

Kiple, Kenneth F., and Virginia H. Kiple
1977 Slave Child Mortality: Some Nutritional Answers to a Perennial Puzzle. *Journal of Social History* 10:284–309.

Kuzawa, Christopher W., and Clarence C. Gravlee
2016 Beyond Genetic Race: Biocultural Insights into the Causes of Racial Health Disparities. In *New Directions in Biocultural Anthropology: Biocultural Approaches to Health and Diet*, edited by Molly K. Zuckerman and Debra L. Martin, pp. 89–105. Wiley & Sons, Hoboken, New Jersey.

Leavitt, Judith Walzer
1986 *Brought to Bed: Childbearing in America, 1750 to 1950*. Rev. ed. Oxford University Press, New York.

Leigh, J. Adam, Manrique Alvarez, and Carlos J. Rodriguez
2016 Ethnic Minorities and Coronary Heart Disease: An Update and Future Directions. *Current Atherosclerosis Reports* 18(2):1–10.

Litwack, Leon F.
1998 *Trouble in Mind: Black Southerners in the Age of Jim Crow*. Knopf, New York.

Loudon, Irvine
1988 Maternal Mortality: 1880–1950: Some Regional and International Comparisons. *Social History of Medicine* 1:183–228.

Maeda, Hiroshi
2018 The Rise of the Current Mortality Pattern of the United States, 1890–1930. *American Journal of Epidemiology* 187:639–646.

McMillen, Sally
1985 Mother's Sacred Duty: Breast-Feeding Patterns among Middle- and Upper-Class Women in the Antebellum South. *Journal of Southern History* 51:333–356.

Newman, Sophie L., and Rebecca L. Gowland
2017 Dedicated Followers of Fashion? Bioarchaeological Perspectives on Socio-Economic Status, Inequality, and Health in Urban Children from the Industrial Revolution (18th–19th C), England. *International Journal of Osteoarchaeology* 27:217–229.

Noonan, Allan, Hector E. Velasco-Mondragon, and Fernando Wagner
2016 Improving the Health of African Americans in the USA. *Public Health Reviews* 37:12. DOI 10.1186/s40985-016-0025-4.

Oster, Warren J., Guy G. Weaver, Jamison P. Richardson, and Jason M. Wyatt
2005 *Archaeological and Osteological Investigations of the Providence Baptist Church Cemetery (40SY619), Memphis-Shelby County Airport, Memphis, Shelby County, Tennessee*. Submitted to Memphis-Shelby County Airport Authority and Allen & Hoshall. Copies available from Weaver & Associates, Memphis.

Oxenham, Marc, and Ivor Cavill
2010 Porotic Hyperostosis and Cribra Orbitalia: The Erythropoietic Response to Iron-Deficiency Anaemia. *Anthropological Science* 118:199–200.

Palmer, David Thomas
2005 "Counterpunch the Devil with the Word": African American Daily Life at Alma and Riverlake Plantations, Louisiana, 1870–1940. PhD dissertation, Department of Anthropology, University of California, Berkeley.

Penningroth, Dylan C.
2003 *The Claims of Kinfolk: African American Property and Community in the Nineteenth-Century South*. University of North Carolina Press, Chapel Hill.

Peter, Duane E., Marsha Prior, Melissa M. Green, and Victoria G. Clow
2000 *Freedman's Cemetery: A Legacy of a Black Community in Dallas, Texas*. Geo-Marine Inc. Submitted to the Texas Department of Transportation, Contract No. 8-0473. Copies available from Geo-Marine, Plano, Texas.

Prather, Cynthia, Taleria R. Fuller, Khiya J. Marshall, and William L. Jeffries
2016 The Impact of Racism on the Sexual and Reproductive Health of African American Women. *Journal of Women's Health* 25:664–671.

Preston, Samuel H., and Michael R. Haines
1991 *Fatal Years: Child Mortality in Late Nineteenth-Century America*. Princeton University Press, Princeton.

Rankin-Hill, Lesley M.
1997 *A Biohistory of Nineteenth-Century Afro-Americans: The Burial Remains of a Philadelphia Cemetery*. Praeger, Santa Barbara, California.
2016 Identifying the First African Baptist Church: Searching for Historically Invisible People. In *New Directions in Biocultural Anthropology: Biocultural Approaches to Health and Diet*, edited by Molly K. Zuckerman and Debra L. Martin, pp. 133–156. Wiley & Sons, Hoboken, New Jersey.

Rose, Jerome C. (editor)
1985 *Gone to a Better Land: A Biohistory of a Rural Black Cemetery in the Post-Reconstruction South*. Arkansas Archeological Survey Research Series No. 25. Submitted to the U.S. Army Corps of Engineers. Copies available from the Arkansas Archeological Survey, Fayetteville.

Shogren, Michael G., Kenneth R. Turner, and Jody C. Perroni
1989 *Elko Switch Cemetery: An Archaeological Perspective*. Division of Archaeology, Alabama State Museum of Natural History, University of Alabama. Submitted to the Alabama Highway Department.

Sledge, Daniel, and George Mohler
2013 Eliminating Malaria in the American South: An Analysis of the Decline of Malaria in 1930s Alabama. *American Journal of Public Health* 103:1381–1392.

Steckel, Richard H.
1995 Stature and the Standard of Living. *Journal of Economic Literature* 33:1903–1940.

Stone, Pamela K.
2016 Biocultural Perspectives on Maternal Mortality and Obstetrical Death from the Past to the Present. *American Journal of Physical Anthropology* 159(S61): S150–S171.

Teague, Megan A., and James M. Davidson
2011 Victorian Ideals and Evolving Realities: Late-Nineteenth Century and Early-Twentieth Century Black Dallas and an Engendered African America. In *The Materiality of Freedom: Archaeologies of Post-Emancipation Life*, edited by Jodi A. Barnes, pp. 87–114. University of South Carolina Press, Columbia.

Thelin, A., B. Jansson, B. Jacobsson, and H. Ström
1997 Coxarthrosis and Farm Work: A Case-Referent Study. *American Journal of Industrial Medicine* 32 (5):497–501.
Thompson, Brandon S.
2009 A Comparative Health Analysis of the Historic African American Cemetery Population from 1LA151, Foster Cemetery, to Three Contemporaneous Historic Southeastern African American Cemetery Populations. Master's thesis, Department of Anthropology, University of Alabama, Tuscaloosa.
2017 A Comparison of Ethnicity and Tuberculosis in the Historic Southeast. *Historical Archaeology* 51:531–541.
Tolnay, Stewart E.
1981 Trends in Total and Marital Fertility for Black Americans, 1886–1899. *Demography* 18:443–463.
1987 The Decline of Black Marital Fertility in the Rural South. *American Sociological Review* 52:211–217.
Tolnay, Stewart E., and Patricia J. Glynn
1994 The Persistence of High Fertility in the American South on the Eve of the Baby Boom. *Demography* 31:615–631.
Trinity River Authority of Texas
2019 History of Water Quality in the Trinity River Basin. Electronic document, http://www.trinityra.org/default.asp?contentID=91, accessed February 1, 2019.
Troesken, Werner
2004 *Water, Race, and Disease*. MIT Press, Cambridge, Massachusetts.
Tuma, Michael W.
2006 Ethnoarchaeology of Subsistence Behaviors within a Rural African American Community: Implications for Interpreting Vertebrate Faunal Data from Slave Quarters Areas of Antebellum Plantation Sites. *Historical Archaeology* 40(4):1–26.
U.S. Census Bureau
1881 *United States Decennial Census for 1880*. Government Printing Office, Washington, DC.
1891 *United States Decennial Census for 1890*. Government Printing Office, Washington, DC.
1901 *United States Decennial Census for 1900*. Government Printing Office, Washington, DC.
1910 *Statistics of Cities Having a Population of over 30,000, 1907*. Government Printing Office, Washington, DC.
1921 *United States Decennial Census for 1920*. Government Printing Office, Washington DC.
U.S. Department of Commerce
1916 General Statistics of Cities: 1915. Bureau of the Census. Electronic document, https://babel.hathitrust.org/cgi/pt?id=hvd.32044026651810&view=1up&seq=7, accessed January 12, 2019.
Vanderpool, Emily M. R., and Bethany L. Turner
2013 Stable Isotopic Reconstruction of Diet and Residential Mobility in a Postbellum African American Community in Rural Georgia. *Southeastern Archaeology* 32:97–110.
Walker, Phillip L., Rhonda R. Bathurst, Rebecca Richman, Thor Gjerdrum, and Valerie A. Andrushko
2009 The Causes of Porotic Hyperostosis and Cribra Orbitalia: A Reappraisal of the Iron-Deficiency-Anemia Hypothesis. *American Journal of Physical Anthropology* 139:109–125.
Walker, Phillip L., John R. Johnson, and Patricia M. Lambert
1988 Age and Sex Biases in the Preservation of Human Skeletal Remains. *American Journal of Physical Anthropology* 76:183–188.
Watkins, Beverly
1985 Historical Background. In *Gone to a Better Land: A Biohistory of a Rural Black Cemetery in the Post-Reconstruction South*, edited by Jerome C. Rose, pp. 6–17. Arkansas Archeological Survey, Fayetteville.
Watkins, Rachel J.
2012 Variation in Health and Socioeconomic Status within the W. Montague Cobb Skeletal Collection: Degenerative Joint Disease, Trauma and Cause of Death. *International Journal of Osteoarchaeology* 22:22–44.
Weiss, Elizabeth, and R. Jurmain
2007 Osteoarthritis Revisited: A Contemporary Review of Aetiology. *International Journal of Osteoarchaeology* 17:437–450.
White, Tim D., and Pieter A. Folkens
2005 *The Human Bone Manual*. Elsevier Academic, Amsterdam.
Wilcox, Lynne S.
2008 Worms and Germs, Drink and Dementia: US Health, Society, and Policy in the Early 20th Century. *Preventing Chronic Disease* 5(4):A135.
Wilkie, Laurie A.
2003 *The Archaeology of Mothering: An African-American Midwife's Tale*. Routledge, New York.
Wilkison, Kyle G.
2008 *Yeomen, Sharecroppers, and Socialists: Plain Folk Protest in Texas, 1870–1914*. Texas A&M University Press, College Station.
Wilson, Rebecca J.
2005 The Health Status of Early 20th Century Blacks from the Providence Baptist Church Cemetery (40SY619) in Shelby County, Tennessee. Master's thesis, Department of Anthropology, University of Tennessee, Knoxville.
Wood, James W., George R. Milner, Henry C. Harpending, Kenneth M. Weiss, Mark N. Cohen, Leslie E. Eisenberg, Dale L. Hutchinson, Rimantas Jankauskas, Gintautas Česnys, M. Anne Katzenberg, John R. Lukacs, Janet W. McGrath, Eric Abella Roth, Douglas H. Ubelaker, and Richard G. Wilkinson
1992 The Osteological Paradox: Problems of Inferring Prehistoric Health from Skeletal Samples [and Comments and Reply]. *Current Anthropology* 33:343–370.
Zuckerman, Molly K., and John Crandall
2019 Reconsidering Sex and Gender in Relation to Health and Disease in Bioarchaeology. *Journal of Anthropological Archaeology* 54: 161–71.

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