### **RESEARCH ARTICLE**



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# Ancestry, health, and lived experiences of enslaved Africans in 18th century Charleston: An osteobiographical analysis

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### Abstract

**Objectives:** In 2013, the burials of 36 individuals of putative African ancestry were discovered during renovation of the Gaillard Center in downtown Charleston, South Carolina. The Charleston community facilitated a bioarchaeological and mitogenomic study to gain insights into the lives of these unknown persons, referred to as the Anson Street Ancestors, including their ancestry, health, and lived experiences in the 18th century.

**Methods:** Metric and morphological assessments of skeletal and dental characteristics were recorded, and enamel and cortical bone strontium stable isotope values generated. Whole mitochondrial genomes were sequenced and analyzed.

**Results:** Osteological analysis identified adults, both females and males, and subadults at the site, and estimated African ancestry for most individuals. Skeletal trauma and pathology were infrequent, but many individuals exhibited dental decay and abscesses. Strontium isotope data suggested these individuals mostly originated in Charleston or sub-Saharan Africa, with many being long-term residents of Charleston. Nearly all had mitochondrial lineages belonging to African haplogroups (L0-L3, H1cb1a), with two individuals sharing the same L3e2a haplotype, while one had a Native American A2 mtDNA.

**Discussion:** This study generated detailed osteobiographies of the Anson Street Ancestors, who were likely of enslaved status. Our results indicate that the Ancestors have diverse maternal African ancestries and are largely unrelated, with most being born locally. These details reveal the demographic impact of the trans-Atlantic slave trade. Our analysis further illuminates the lived experiences of individuals buried at Anson Street, and expands our understanding of 18th century African history in Charleston.

### KEYWORDS

ancient DNA, colonization, isotope, osteology, slavery

### 1 | INTRODUCTION

Between A.D. 1670-1807, nearly 300,000 African persons were forcibly enslaved and brought from their homelands to North America during the trans-Atlantic slave trade.<sup>1</sup> Almost 50% of those persons, totaling 149,961 individuals, were brought through the port of Charleston<sup>2</sup> (Voyages, 2020). From the city's establishment as a British North American colony in A.D. 1670 to Emancipation in

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A.D. 1863, Charleston and the surrounding Lowcountry was a slave holding society, profiting from the exploitation of enslaved labor that drove the colony's economy (P. Wood, 1974). In Charleston, "slaves were the muscle building the region's economy, [and] the slave trade was the system's lifeblood" (O'Malley, 2017, p. 274).

While there is growing knowledge of the logistics of the trans-Atlantic slave trade and its role in the development of the city of Charleston, information about the individual histories of enslaved persons is limited (Kytle & Roberts, 2018; Richardson & Eltis, 2010). Slave ship registers indicate that the majority of enslaved persons brought into Charleston came from three regional areas, namely, the upper and lower region of the West African coast, and the coast of Central Africa (Kolchin, 2003: Littlefield, 1981). These individuals embodied the diverse cultures, languages, and religions of those regions, yet the trafficking and commodification of human lives reduced their personhood to numbers in slave ship manifests or values in economic and property records (McMillin, 2004). While personal accounts of African persons who gained their freedom, such as Olaudah Equiano (Equaino, 1789), have provided valuable insights into the experiences of African persons in early colonial North America (Gates Jr & Andrews, 1998; O'Malley, 2014), these autobiographies are infrequent in the historiographical record, leaving many enslaved and free Africans anonymous to history.

#### 1.1 **Bioarchaeological and osteobiographical** perspectives

Bioarchaeological methods have been used to illuminate the demographic profiles and experiences of enslaved persons (Battle-Baptiste, 2017; Blakey, 2001; Franklin & McKee, 2004). While the remains of only a handful of African or African-descended individuals from North America have been studied, bioarchaeological methods have provided invaluable information about age, sex, and lived experience in plantation, church, and urban burial contexts (Angel, Kelley, Parrington, & Pinter, 1987; Blakey & Rankin-Hill, 2009; Owsley, Orser, Mann, Moore-Jansen, & Montgomery, 1987; Rathbun, 1987; Rose, 1985; W. Wood, Burns, & Lee, 1986; Woodruff, Sawyer, & Perry, 2007). Such methods have also been used to describe variation in social and biological health related to experiences of enslavement, discrimination, and/or inequality (Blakey, 2001; Rankin-Hill, 1997; Watkins, 2012). Biochemical methods, such as strontium isotope analysis, have further provided details about mobility patterns of enslaved African populations in North America and the Caribbean by analyzing isotopic absorption in enamel and bone (Dent, 2017; France et al., 2020; Goodman et al., 2004; Laffoon, Espersen, & Mickleburgh, 2018).

Invaluable to these studies have been insights obtained from the New York African Burial Ground, whose research team conducted a multi-disciplinary study on the remains of over four hundred 17th and 18th century African-descended individuals unearthed from the site (Blakey, 1998; Blakey & Rankin-Hill, 2009). This project conducted osteological analyses that revealed important details about population demography (Blakey, Rankin-Hill, Howson, Wilson, & Carrington, 2009; Jackson et al., 2009; Rankin-Hill et al., 2009), labor activities, lived experiences (Wilczak, Watkins, Null, & Blakey, 2009), as well as nutrition and disease amongst the buried individuals (Mack, Goodman, Blakey, & Mayes, 2009; Null, Blakey, Shujaa, Rankin-Hill, & Carrington, 2009). Notably, isotopic analyses provided some of the earliest insights into the origin and migration histories of the enslaved and free African descended persons (Goodman et al., 2004).

While bioarchaeological and biochemical methods have generated critical information about demography, health, and mobility, new genomic techniques have greatly enlarged our understanding of the ancestry and biological relationships of historic period African populations and their descendants (Benn Torres, 2018; Jackson & Borgelin, 2010). The extraction of DNA from archeological individuals (i.e., ancient DNA) has provided insights into the origins of 17th and 18th century enslaved individuals (Barguera et al., 2020; Fleskes et al., 2019; Lee, Anderson, Dale, & Merriwether, 2009; Sandoval-Velasco et al., 2019; Schroeder et al., 2015). Autosomal and mitochondrial DNA (mtDNA) analyses from these studies indicate the majority of these enslaved persons had ancestral affiliations with West and Central African populations.

Osteobiography offers a useful theoretical framework to integrate documentary, bioarchaeological, and genomic evidence from burial contexts (Hosek & Robb, 2019; Rankin-Hill, 1997; Renschler, 2007). The osteobiographical approach, as originally developed by Saul (1972, 1976), focuses on understanding lived experiences and "[entanglements] within social and cosmological temporalities" (Hosek & Robb, 2019, p. 4). It expands upon population-level osteological studies by integrating multiple analytical tools to yield a deeper understanding of life histories in the archeological record (Robb. 2002). In this study, we integrate isotopic and ancient DNA (aDNA) analyses from the bioarchaeological tool kit with traditional osteobiography to better understand life history and lived experience of African or African-descended persons in 18th century Charleston.

#### The Anson street African burial project 1.2

The 2013 discovery of human remains of putatively African ancestry on the corner of George and Anson Streets during renovations at the Gaillard Center in downtown Charleston provided an opportunity to understand the health, ancestry, and lived experience among African or African-descended persons living during the 18th century (Figure 1). Historical records attesting to the existence of this burial ground, or the identities of the persons that were interred there, have not yet been identified. The City of Charleston contracted a local cultural resources management firm, Brockington and Associates Inc., to conduct an archeological assessment of the site and disinter the 37 burials that had been uncovered. The Gullah Society, a nonprofit organization focused on reclaiming African burial ground sites, took stewardship of the human remains with encouragement from City Mayor John Tecklenburg to ensure their care during their liminal period of disinterment. After a series of conversations with

**FIGURE 1** Map of the Anson Street African Burial Ground on the peninsula of Charleston, SC (USA). Image produced using Google Earth Pro



Charleston's African American community, the Gullah Society initiated a rigorous and multi-method scientific study using archeological, osteological, dental, isotopic, and genomic methods to learn more about the persons found at Anson Street, henceforth referred to as the Anson Street Ancestors. The Gullah Society also developed a program of community engagement to inform stakeholders about the progress of research conducted with the Ancestors.

The resulting Anson Street African Burial Ground (ASABG) Project undertook genetic analyses mindful of debates within the field of ancient DNA studies concerning the ethical sampling of human remains (e.g., Bardill et al., 2018; Fox & Hawks, 2019; Prendergast & Sawchuk, 2018) and the importance of using a community-focused epistemological framework (Blakey, 2008, 2009). Given that the deceased are not able to give consent in this context, it becomes "the right for African Americans to determine the disposition of their ancestral remains" (Blakey, 2010, p. 63). As such, genetic research was undertaken with explicit permission from the Charleston African American community, whose members considered the human remains to represent their ancestors. Community members expressed keen interest in understanding the lives of each individual, as well as the history of the burial ground, thereby fostering an osteobiographical approach to the study of these human remains.

In what follows, we provide a detailed description of the bioarchaeological and complete mitochondrial genome (mitogenome) analyses of the human remains recovered from this site, and situate their resulting osteobiographies within the historical context of the trans-Atlantic slave trade in Charleston during the mid-to-late 18th century. The mitogenome analysis conducted in this study has yielded the largest assemblage of data from historic period Africandescended individuals known to date. In addition, the breadth of bioarchaeological evidence generated in the study provides important insights into the lives of these persons, including their ancestry, health, and lived experiences in 18th century Charleston. Their stories fill significant gaps in our knowledge of African history in colonial America by detailing the personal osteobiographical histories and experiences of those interred at the Anson Street Burial Ground.

### 2 | ETHICS STATEMENT

In accordance with the Gullah Society's goals to preserve, promote, and perpetuate Gullah Geechee culture and traditions, the appropriate ethical treatment of the human remains uncovered at the Gaillard Center was of paramount importance. In May 2019, we reinterred the remains of the Anson Street Ancestors, along with the unused skeletal samples and by-products of the ancient DNA analysis, with ceremony in the grounds of their original resting place (Figure 2a). Over a 16-month period leading up to the reinterment we met multiple times with community members during "*Community Conversations*" events, at which we reported the status of the bioarchaeological and genetic analyses. We also solicited oral and written feedback from community members about the study results, and incorporated this feedback into our research efforts.

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**FIGURE 2** Photographs of the community engagement events undertaken as a part of the ASABG Project. (a) The procession of Ancestors to their original resting place in the reinterment ceremony; individuals enclosed in reinforced boxes wrapped in indgo cloth were placed in a horse-drawn hearse and taken to the site, accompanied by an Egungun Masquerade, spiritual leaders, and members of the community. Photograph provided by B. M. Ghersi; (b) Yoruba priests, Drs. Natalie Washington-Weik, Terrance Weik, and Ade Ofunniyin, conducting the Naming Ceremony of the Ancestors. Photograph provided by R. Fleskes

During a 2019 community outreach event at North Charleston High School, a student asked whether the Ancestors had names. In response to this question, we conducted a traditional Yoruba naming ceremony to acknowledge the personhood and historical legacy of the Anson Street Ancestors and ensure that their remains were returned to the ground with African names and not burial numbers. Led by Yoruba priests Drs. Ade Ofunniyin, Natalie Washington-Weik, and Terrance Weik, all Ancestors were given names based on spiritual guidance, the scientific findings outlined below, and names sourced from Lorenzo Dow Turner's *Africanisms of the Gullah Dialect* (Turner, 1949; Figure 2b). We honor this process by using these names along with sample numbers when referring to the Ancestors in the manuscript text, figures, and tables.

### 3 | METHODS

For this study, we used a multi-method approach to construct detailed osteobiographies of the Anson Street Ancestors. These methods included archaeology, osteology, strontium stable isotopes, and mitogenome sequencing.

### 3.1 | Archeological context

Upon discovery of the human remains at the Gaillard Center site in 2013, Brockington and Associates Inc. and the J. Henry Stuhr Funeral Home (Robert Parks, Funeral Director) were contracted by the City of Charleston to excavate the remains, with eventual plans to relocate these individuals. Excavation of the burials took place over a one-month period, following the procedures outlined in SC Code of Laws (2007), Sections 27-43-10 to 27-43-40. All burial materials were relocated to a climate-controlled facility at Brockington and Associates Inc., for temporary storage and analysis. The burial artifacts were catalogued and used to date the period of interment at the site. Documentary research was undertaken in an attempt to identify the burial ground in the historiographic record.

### 3.2 | Osteological analysis

Osteological data collection was conducted in accordance with the standards set forth by the Field Museum of Natural History in Chicago and the National Science Foundation for collecting data from human skeletal remains scheduled to be repatriated. Each individual was examined for age, sex, ancestry, and pathology, as permitted by preservation. Any observed traumas or lesions were documented according to the accepted standards (i.e., Buikstra & Ubelaker, 1994).

Dental traits, health, and age were assessed for all individuals with intact dentition. Dental nonmetric traits and modifications were noted. Dental wear, enamel hypoplasia, lesions, and abscesses were coded based on severity and location to evaluate oral health. Dental development was recorded according to Buikstra and Ubelaker (1994), and evaluated with cranial and postcranial evidence to estimate approximate age at death.

### 3.3 | Strontium stable isotope analysis

### 3.3.1 | Strontium background

Biologically available strontium from a locally sourced diet enters the crystalline matrix of the hard tissues of the body through calcium substitution, producing an averaged value of the biologically available strontium in the area (Bentley, 2006; Goodman et al., 2004; Hodell, Quinn, Brenner, & Kamenov, 2004; Slater, Hedman, & Emerson, 2014). Given that strontium absorption is determined by local diet, <sup>87</sup>Sr/<sup>86</sup>Sr values in tooth enamel can also reflect cultural regularities of subsistence rather than exact regions of origin (Bentley et al., 2012; Pollard, 2011). As a result, both intra- and interpopulation comparisons are needed to determine region of origin and mobility.

### 3.3.2 | Reference samples

A faunal baseline for strontium isotope values was established for the Charleston region using three faunal bone specimens (spp. *Bos taurus, Ovis aries,* and *Melegaris gallopavo*) found within the grave shafts of three burials. Given that three faunal samples do not represent the full range of strontium variation in the area, the deviation from the population mean between each individual was also calculated to determine whether their origin in Charleston was plausible (Bentley et al., 2012)

### 3.3.3 | Regions of comparison

Published <sup>87</sup>Sr/<sup>86</sup>Sr values for Africa were used for comparison with those of the Anson Street Ancestors. Comparative values were limited to a small subset of previously published values directly associated with the West African coast (<sup>87</sup>Sr/<sup>86</sup>Sr = 0.7136-0.7355), ranging from the coast of present-day Senegal to Angola (Goodman et al., 2004; Price, Tiesler, & Burton, 2006; Pye, 2004; Schroeder, O'Connell, Evans, Shuler, & Hedges, 2009). These estimates are notable because they represent very high <sup>87</sup>Sr/<sup>86</sup>Sr values attributed to ancient Cratonic formations, which differ substantially from North American values (Price et al., 2006, 2012).

However, strontium isotopes are subject to equifinality, that is, different regions possessing similar baseline ranges due to local geological processes (Laffoon, Rojas, & Hofman, 2013; Price, Burton, & Stoltman, 2007; Sillen & Kavanagh, 1982). For instance, biologically available strontium values in the Caribbean (<sup>87</sup>Sr/<sup>86</sup>Sr = 0.7066-0.7096; Laffoon, Davies, Hoogland, & Hofman, 2012) are only slightly lower than the Charleston faunal range assessed in this study (<sup>86</sup>Sr/<sup>87</sup>Sr = 0.7100-0.7107). Given the historical connection between Charleston and Barbados and the role of the Caribbean in the trans-Atlantic slave trade (Morgan, 1998; Richardson & Eltis, 2010; P. Wood, 1974), conservative interpretations that exclude regions of origin, rather than identify provenance, through the assessment of intrapopulation variance and the range of overlap with other geographic regions of interest are necessary (Pollard, 2011; Price et al., 2006, 2012; Slater et al., 2014).

### 3.3.4 | Sample preparation

Bone and tooth samples were collected from human and three nonhuman remains at the ASABG for strontium isotopic analysis. All samples were mechanically cleaned and subjected to weak acid protocols to limit the potential impacts of diagenesis (Koch, Tuross, & Fogel, 1997). Samples were then prepared according to Slater et al. (2014), with <sup>87</sup>Sr/<sup>86</sup>Sr composition and concentration PHYSICAL NTHROPOLOGY –WILEY-

determined by Nu Plasma Multi-Collector-Inductively-Coupled-Plasma Mass-spectrometer (MC-ICP-MS, Nu Plasma HR; Nu Instruments, UK) at the University of Illinois. Ratios were corrected for mass bias fractionation using an internal normalization to <sup>87</sup>Sr/<sup>86</sup>Sr of 0.1194. All <sup>87</sup>Sr/<sup>86</sup>Sr values were normalized using within-run values of the NBS 987 standard (accepted <sup>87</sup>Sr/<sup>86</sup>Sr = 0. 710255; reported run average  $0.71026 \pm 0.0000876$ , n = 5), SCS Coral (accepted <sup>87</sup>Sr/<sup>86</sup>Sr = 0.70918; reported run average 0.70925 ± 0.0000701; n = 4) and E&A (Elmer and Amend accepted  ${}^{87}$ Sr/ ${}^{86}$ Sr = 0.70804; reported run average  $0.70812 \pm 0.0000194$ , n = 3). The average, standard deviation ( $\sigma$ ), and individual deviation from the mean were independently calculated for <sup>87</sup>Sr/<sup>86</sup>Sr enamel and bone values, for both the Ancestors and faunal samples. The <sup>87</sup>Sr/<sup>86</sup>Sr enamel and bone values were plotted using R, taking into account osteological age and sex estimations. For individuals with both <sup>87</sup>Sr/<sup>86</sup>Sr enamel and bone values, individual deviation from the mean was plotted, noting 1  $\sigma$  for both the enamel and hone mean

### 3.4 | Ancient mitogenome analysis

Two samples from each of the Anson Street Ancestors, with preference for petrous-temporal bone and molar teeth, were collected at Brockington and Associates, Inc. to increase the success of the ancient DNA analysis. The DNA analyses were conducted in both the clean room and the modern DNA labs at the Molecular Anthropology Laboratories at the University of Tennessee-Knoxville (UTK). A description of the facilities and the decontamination and authentication protocols used in this study are described in Section S1.1.

For each sample, 0.20–0.33 g of powdered bone were weighed for DNA extraction, following sample decontamination (Section S1.2). DNA was extracted using a silica spin column method (Dabney et al., 2013; Section S1.3). Dual-index Next-Generation sequencing libraries were prepared using a double-stranded library preparation protocol modified for degraded, low-template DNA samples. In the modern DNA lab, libraries with minimum of 7 ng/µl concentration of DNA were enriched using the myBaits Human Whole Genome Enrichment v4 kit (Arbor Biosciences; Section S1.3; Table S1). Based on the relative quality of DNA extracts, library preparation, and enrichment, aliquots from 34 samples were submitted for pooling and sequenced using an Illumina MiSeq 150PE at UTK's Genomics Core and an Illumina HiSeq (100SE and 150PE) at the University of Pennsylvania's Next Generation Sequencing Genomics Core.

After removing sequence adapters and low-quality bases, mitogenome sequences were aligned to the revised Cambridge Reference Sequence (rCRS) (Andrews et al., 1999) using BWA mem (Li et al., 2009). Variants were called after postalignment filtering, and mtDNA haplogroups identified using Haplogrep 2.1.25 (Weissensteiner et al., 2016) against Phylotree Build 17 (van Oven, 2015). Mitogenome coverage was calculated using Qualimap v2.2.1 (Okonechnikov, Conesa, & García-Alcalde, 2016). Mitogenome contamination was estimated using Contamix against 311 reference mitochondrial genomes (Fu et al., 2013; Section S1.4), and the mtDNA 6 WILEY ANTHROPOLOGY

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control region for persons who handled the bone specimens prior to DNA extraction were Sanger sequenced as an additional control for contamination (Section S1.5).

#### 3.4.1 Network analysis

Phylogenetic relationships between the Anson Street Ancestors were investigated using their mitogenome sequences with the Median-Joining network function in PopArt (Leigh & Bryant, 2015). Network v.4 software (Bandelt, Forster, Sykes, & Richards, 1995; http://fluxusengineering.com) was also used to create a Reduced Median Joining network from mtDNA first hypervariable region sequences (HVS1) to assess the relationship between the H100 lineage and other associated H haplogroups (Section S1.6; Table S2).

#### 3.4.2 Phylogeographic analysis

Comparative mitogenome sequences (n = 125) for African populations with haplogroups overlapping with those observed in the Anson Street Ancestors were compiled from GenBank and the 1000 Genomes Project (Diroma et al., 2014; Table S2). Phylogenetic trees were created using BEAST v1.10.4 software (Drummond & Rambaut, 2007) and projected onto a geographical map of Africa using Phytools (Revell, 2012) in R. GPS coordinates of each reference sample were either provided in the corresponding paper or closely approximated based on population descriptions provided therein (Section S1.6).

#### RESULTS 4

#### 4.1 Archeological analysis

A total of 37 burials were recovered at the Anson Street site. The soil composition in the interments relative to the burial site was noted (Section S2.1). The graveyard was organized in four roughly equally spaced rows with graves spaced evenly along each row (Figure 3). The excavated graves each contained the remains of one individual with the exception of Burial 9, which contained only fragmentary animal remains (Section S1.3; Table S1). All individuals were buried in an extended supine position with a West-to-East orientation. Nails were found in four graves, and brass pins associated with burial shrouds were identified in eight. Copper staining, associated with the presence of brass pins used for burial shrouds, was also noted by greenish discolorations on one or more locations of the crania of 11 individuals.

Twenty-four of the 36 human graves contained burial hardware or grave goods. The latter included coins, ceramics, buttons of various materials, and a large spall gunflint made of English chert. The most precisely datable artifact was a George III copper halfpenny minted in A.D. 1773, which was found as a pair (Figure S2.1). The artifact

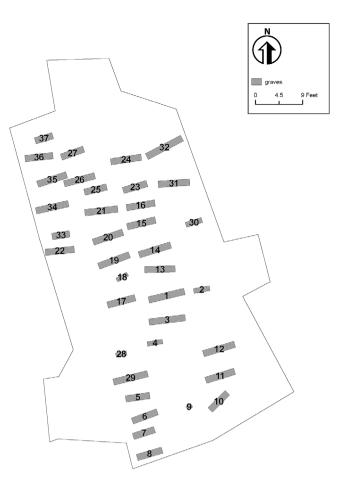


FIGURE 3 Plot map of the excavated burial area. Numbers on the graves correspond to individual IDs, as indicated in Table 3. Image provided by Brockington and Associates, Inc

assemblage dates the period of interment at Anson Street from approximately A.D. 1760-1790 (Table S3).

A variety of grave goods and clothing associated with personal adornment were recovered. One black glass bead was found in the cranium of Omo (CHS18), likely representing a hair ornament or a necklace bead (Figure S2.2). Buttons were also found, indicating that at least 10 individuals were buried with clothing, including a motherof-pearl inlay button positioned on the throat of Juba (CHS14). In addition, clay pipe bowl fragments typically used to smoke tobacco were recovered from the graves of Fumu (CHS19) and Risu (CHS26).

Archival research on the burial ground was undertaken. Projecting the present-day location of the burial ground onto historical plat maps revealed that it lay close to the city's northernmost boundary on farm and pastureland that was undergoing suburban development between A.D. 1745 and 1800 (Figure 4). Land records indicate that the burial ground was situated on privately owned property that originally belonged to George Anson, who subdivided and sold the land to William Ellis and others between A.D. 1757-1761. Property development surrounding the burial ground increased in the AD 1790s, with the land, now known as Ansonborough, being divided into sublots by A.D. 1798.

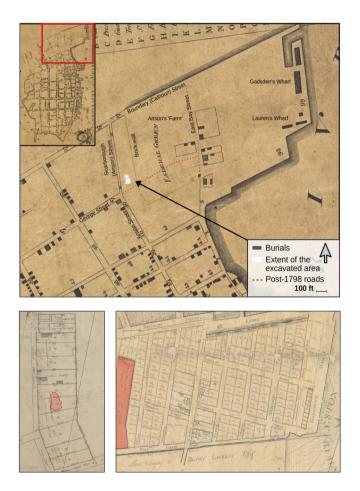
Currently, there is no documentary evidence that attests to the existence of the burial ground or the identities of the persons interred

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there. Given that public burial grounds for enslaved persons lay on the western side of the city and there were no known burial grounds in the area for free persons of color during this time (Trinkley, Hacker, & Southerland, 2010), it is likely that this site was a local place of interment for enslaved African-descended individuals from the surrounding neighborhood.

### 4.2 | Osteological analysis

As noted above, 36 of the 37 burials contained human remains, with Burial 9 containing small animal bone fragments (Table S4). Of the 36 human burials, 28 adults and seven juveniles were identified, with



**FIGURE 4** Location of the Anson Street African Burial Ground in historical plat maps through time, with the highlighted sections outlined in gray and red carried through all subpanels, respectively. The top panel displays an A.D. 1790 map, with contemporary street names and labels. The bottom right map is a plat from A.D. 1795 that shows the development of the neighborhood of Ansonborough. The bottom panels represent a plat map from A.D. 1798 showing the subdivision of lots bordering Scarborough, or Anson Street. The top map is provided by the Library of Congress (Petrie et al., 1790) with assistance from Brockington and Associates, Inc., N. Butler, and J. Gilmore to identify the burial ground. The bottom maps were accessed from the Charleston County Register of Deeds by G. Mishoe

ages ranging from approximately 6 months to >40 years at death (Figure 5). While the degree of preservation and juvenile age status affected the ability to estimate sex for some individuals, seven adult males and five adult females were identified. Of the identified females, most belonged to the young adult or the adult age category, with the opposite pattern observed for males (Figure 5). Examination of the cranio-facial morphology of the 33 partially preserved crania suggested these individuals were of putative African ancestry.

We evaluated the human remains for skeletal indicators of stress and disease. Observed skeletal anomalies included evidence of repetitive activity, antemortem fractures, and pathological conditions (-Table S4). Skeletal changes due to rigorous muscle use were present in four adult individuals, with near ubiquitous hypertrophy of the supinator crests, deltoid tuberosities, soleal lines, and the lineae asperae. Several individuals also showed flexor tendon sheath hypertrophy in the phalanges indicating repetitive activities requiring a firm grip, such as grasping objects or tools. The right calcaneus of *Mbangi* (CHS08), a mid-adult male, displayed a vertically oriented exostosis at the point of the Achilles tendon insertion, which was likely the result of athletic overuse of the calf muscles (Capasso, Kennedy, & Wilczak, 1999; Figure S3.1).

Antemortem trauma and fractures were infrequent in the Ancestors. *Fumu* (CHS19) sustained a possible rotator cuff injury to the left shoulder either due to acute trauma or repetitive overuse of the shoulder muscles (Figure S3.2). Two healed phalanx fractures were also noted on *Babatunde* (CHS06) and *Lima* (CHS03). Otherwise, no clear examples of trauma were noted.

Possible disease conditions were observed in a few Anson Street individuals. The right radius of Fumu (CHS19) displayed cortical thinning and medullary expansion involving the entire distal half of the bone (Figure S3.3). The cause of this anomaly is unknown, although infarction from sickle cell disease or unspecified tumor could be involved (Eisenberg, 2010). Mbangi (CHS08) exhibited several enlarged nutrient foramina in the left metatarsals and left calcaneus, which are associated with several conditions including thalassemia, Gaucher disease (Fink, Pastakia, & Barranger, 1984), leprosy (Newman, Casey, Bois, & Gallagher, 1972), and sickle cell disease (Huo, Friedlaender, & Marsh, 1990; Figure S3.4). Bilateral partial coalition of the lunate and triguetral bones of the wrist was found in Lima (CHS03l; Figure S3.5). This is usually an asymptomatic, congenital condition where two separate small bones of the wrist form a pseudo-union, and is reported at higher frequency in West African populations (DeFazio, Cousins, Miversuski Jr, & Cardoso, 2013). Skeletal evidence of degenerative joint disease was infrequent, with only one older adult male, Kuto (CHS04), displaying bilateral degeneration at the proximal radioulnar joint (Figure S3.6).

### 4.3 | Dental indicators of diet and infection

Preserved dentition from 28 individuals, including six subadults and 22 adults, were analyzed to understand the oral health and life histories of the Anson Street Ancestors (Table 1; Table S4). In general, they

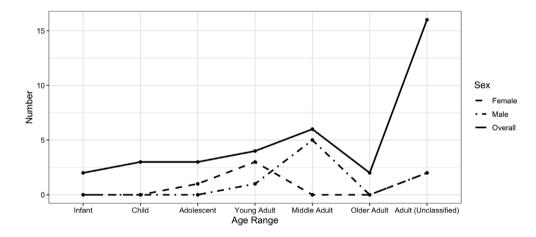
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had a high frequency of dental caries, abscesses, and many had lost one or more teeth. All aspects of common dental diseases (i.e., calculus decay, abscesses, and subsequent loss) increased in severity with age. Most individuals with relatively intact dentition had significant calculus build up. Interestingly, the frequency of enamel hypoplasias was rather low (14%), and only reported in the adult age group with minor severity. Most adults in the Anson Street sample exhibited some form of advanced occlusal wear, with older individuals having worn their teeth flat, indicative of a highly abrasive diet (Addy & Shellis, 2006).

Intentional dental modifications were observed among some of the Anson Street Ancestors. The maxillary right and left lateral incisors of *Ganda* (CHS23) were intentionally filed, chipped, or otherwise modified into a pointed shape. This practice is typically observed in sub-Saharan African populations (Pinchi et al., 2015; Schroeder, Haviser, & Price, 2014; Stewart & Groome, 1968), and thought to be undertaken for aesthetic purposes or traditional rites of passage (Handler, 1994; Mower, 1999; Figure 6a). Archival records of enslaved African individuals with intentional dental modifications such as these have previously been observed in the osteological remains of enslaved African populations from the Caribbean (Handler, Corruccini, & Mutaw, 1982; Schroeder et al., 2014; Stewart, 1939; Stewart & Groome, 1968) and the Americas (Ortner, 1966; Tiesler, 2002), including the New York African Burial Ground (Goodman et al., 2009).

Anika (CHS10), a young adult female, exhibited midline filing of the maxillary right and left central incisors into a wedged appearance, with no wear recorded on the mandibular teeth (Figure 6b). This pattern is similar to cultural dental modifications practiced in sub-Saharan African populations (Haour & Pearson, 2005; Wasterlain, Neves, & Ferreira, 2016), and the Caribbean (Roksandic, Alarie, Suárez, Huebner, & Roksandic, 2016). However, it has also been interpreted as an activity-induced dental modification associated with processing fibrous materials, as observed in 14th–17th century Indigenous North American individuals (Blakely & Beck, 1984). In a clearer example of activity-induced dental modification, three individuals displayed varying degrees of matching semi-lunar notches in the maxillary and mandibular teeth attributed habitual clenching of clay tobacco pipes between the jaw (Corruccini, Handler, Mutaw, & Lange, 1982; Figure 6c).

In addition to these dental pathologies, nonmetric traits were assessed. Shovel-shaped incisors, which are characterized by mesial and distal marginal ridges on the lingual surface of incisor teeth, were also noted in several individuals (Carbonell, 1963; Figure S3.7). This

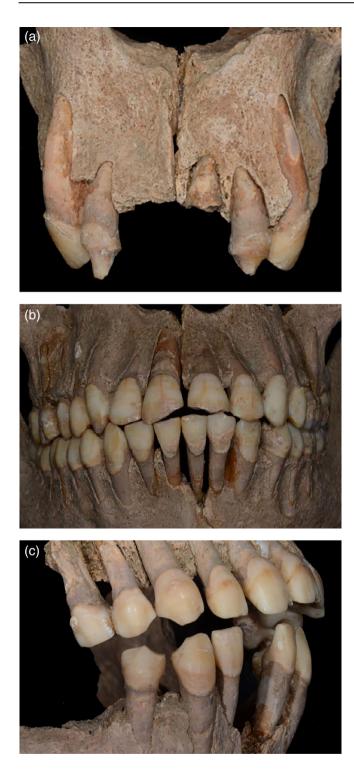


**FIGURE 5** Graph of the distribution of estimated osteological age by sex in the Anson Street sample. Age ranges in years are classified as follows: Infant (0–3), Child (3–12), Adolescent (12–20), Young Adult (20–35), Middle Adult (35–50), and Older Adult (50+). The solid line represents the total number of individuals (n = 36), the dot-dash line representing the sub-set of females (n = 8), and the dashed line representing the sub-set of males (n = 6), as estimated by osteological sex assessment

	Carious lesions		Abscessed tooth		General tooth loss		Enamel hypoplasia		Occlusal wear	
Age	#	%	#	%	#	%	#	%	#	%
Subadult (n = 4)	1	3	0	0	0	0	0	0	1	3
Adult (n = 22)	13	46	11	40	10	36	4	14	13	46
Total (n = 28)	14	49	11	40	10	36	4	14	14	49

TABLE 1 Dental health of the Anson Street sample based on age group

*Note*: The subadult group includes infant, child, and adolescent individuals, while the adult group includes young adult, middle adult, and older adult age designations. The numbers refer to the number of individuals with at least one occurrence, and frequency is calculated based on the total number of individuals with preserved dentition (n = 28).



**FIGURE 6** Dental modifications displayed in the Anson Street individuals. (a) Sharpening of the left and right second maxillary incisors of *Ganda* (CHS23); (b) Wear to the medial edges of the left and right first maxillary incisors of *Anika* (CHS10); (c) Circular wear facets between the right canines and first premolars due to habitual clenching of clay pipe stems associated with tobacco smoking in *Tima* (CHS31)

trait is common in North American and Asian populations, but also present at low frequencies in African and European populations (Scott, 1997).

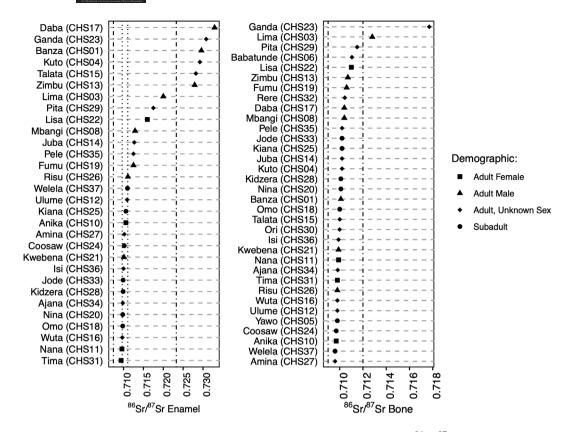
### 4.4 | Stable isotope analysis

Strontium stable isotopes values were successfully characterized in 35 individuals. Twenty-three individuals yielded bone and enamel values, with six additional individuals yielding only bone values, and six other individuals yielding only enamel values. The <sup>87</sup>Sr/<sup>86</sup>Sr tooth enamel values ranged from 0.7094 to 0.7329 (n = 29, 0.7102 ± 0.0079), and <sup>87</sup>Sr/<sup>86</sup>Sr cortical bone values ranged from 0.7096 to 0.7177 (n = 29, 0.7105 ± 0.0015; Table S5). As a whole, <sup>87</sup>Sr/<sup>86</sup>Sr values in bone and enamel indicated that males had more radiogenic values than females, and juveniles had less radiogenic values than adults (Figure 7).

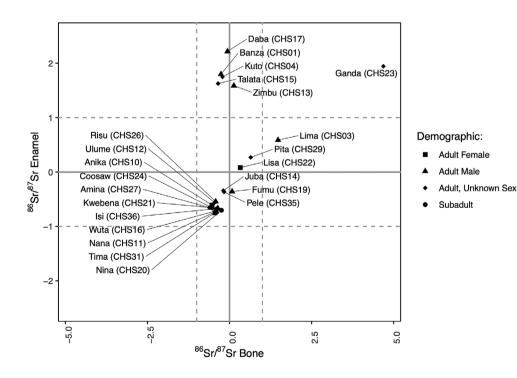
Enamel ratios provide insight into mobility during childhood. Juveniles from the ASABG represented the most probable Charleston born population, which was defined as being within one standard deviation ( $\sigma$ ) of the population mean and within 2  $\sigma$  of the faunal baseline. Juvenile  $^{87}$ Sr/ $^{86}$ Sr values for enamel were closely clustered (n = 7, 0.7102 ± 0.0005), and virtually identical to the Charleston faunal values (n = 3, 0.7104 ± 0.0004; Table S5). Yet, overall, 23 out of 29 Anson Street Ancestors, including juveniles, had enamel <sup>87</sup>Sr/<sup>86</sup>Sr values that fell within 1  $\sigma$  of the population mean (Figures 7 and 8). Thirteen individuals were tightly clustered within 2  $\sigma$  of the faunal baseline, suggesting a plausible origin in Charleston. Seven individuals. including Lima (CHS03). Mbangi (CHS08), Juba (CHS14), Fumu (CHS19), Lisa (CHS22), Pita (CHS29), and Pele (CHS35), had slightly greater radiogenic values of strontium, but were within 1  $\sigma$  of the population mean. By contrast, Banza (CHS01), Kuto (CHS04), Zimbu (CHS13), Talata (CHS15), Daba (CHS17), and Ganda (CHS23) had radiogenic <sup>87</sup>Sr/<sup>86</sup>Sr values greater than 0.7250, which is 1.5–2  $\sigma$  beyond the enamel  ${}^{87}$ Sr/ ${}^{86}$ Sr population mean, strongly suggesting exclusion from a Charleston origin (Figures 7 and 8). The enamel <sup>87</sup>Sr/<sup>86</sup>Sr values for these six individuals were also similar to those previously reported for individuals of West Africa origin (Price et al., 2012; Schroeder et al., 2009).

Cortical bone ratios illuminate mobility during the last 10 years of life. The vast majority (n = 27) individuals with  ${}^{87}$ Sr/ ${}^{86}$ Sr bone values had values within 1  $\sigma$  of the population mean (Figures 7 and 8). Two adult individuals, *Ganda* (CHS23) and *Lima* (CHS03), had radiogenic values beyond 1.5  $\sigma$  of the population mean, suggesting they lived in the Charleston area for a time insufficient for full bone acclimation. Only one individual, *Ganda* (CHS23), displayed a very high  ${}^{87}$ Sr/ ${}^{86}$ Sr bone value that clearly fell within the reported West African range (Price et al., 2012; Schroeder et al., 2009).

Plotting the individual deviations from the mean for individuals with both <sup>87</sup>Sr/<sup>86</sup>Sr bone and tooth enamel values revealed slight differences in residence and/or dietary patterns in the Anson Street Ancestors (Figure 8). The majority of individuals (n = 16) had both <sup>87</sup>Sr/<sup>86</sup>Sr bone and tooth enamel values that fell within 1  $\sigma$  of the population mean for both bone and enamel. For the subgroup of six individuals with enamel values outside 1  $\sigma$  of the population mean, only *Ganda* (CHS23) contained a significantly higher cortical bone ratio. As a whole, the cortical bone and enamel strontium values were highly similar to one another, with the standard deviation of enamel values being slightly wider due to the group of six individuals with higher enamel ratios.



**FIGURE 7** Binomial distribution of the enamel (left plot) and cortical bone (right plot) strontium (<sup>86</sup>Sr/<sup>87</sup>Sr) isotope values, plotted independently. Symbols representing the estimated age and sex are based on osteological profiles. Vertical dashed lines indicate two standard deviations from the group mean, and vertical dotted lines represent one standard deviation from the faunal enamel baseline



deviation from the enamel and cortical bone strontium ( $^{86}Sr/^{87}Sr$ ) value means, with osteological age and sex estimations. Dashed lines indicate one standard deviation from group mean for enamel ratios on the *y*-axis, and cortical bone ratio on the *x*-axis. Only individuals with both  $^{86}Sr/^{87}Sr$  enamel and cortical bone values (*n* = 23) are plotted. Symbols the age and sex estimations based on osteological profiles

Individual

FIGURE 8

### 4.5 | Mitogenome analysis

We were able to obtain complete mitogenome sequences for 31 of the 36 Anson Street Ancestors, despite the varying preservation of the human remains. The mitogenomes were sequenced to a depth coverage ranging from 31 to 418× (Table 2), with an average fragment length ranging between 63 and 88 base pairs (Table S6). The estimated percentage of mtDNAcontamination using mitogenome

sequences ranged from 1.3 to 4.2%, which is comparable to observations in other historic period samples (Sandoval-Velasco et al., 2019; Table 2). In addition, the mitochondrial haplotypes for the Ancestors did not match any of those obtained from the sample handlers who provided DNAs for comparative analysis (Table S7).

The mitogenome sequence analysis largely confirmed osteological assessments of ancestry and supported the isotopic results. A diversity of mtDNA lineages were identified in the Anson Street Ancestors, including haplogroups L0-L3, H100, U6, and A2 (Table 2; Table S8).

Twenty-nine of the 31 mtDNAs identified belonged to African haplogroups L0-L3. When plotted in a reduced-median network, a clear branching by haplogroup classification was noted (Figure 9). Haplogroup L0, represented by *Rere* (CHS32), was far removed from the internal node of the tree. The L1 mitogenomes from six individuals belonged to two main subhaplogroups, L1b and L1c. Nine individuals had L2 mitogenomes, with these belonging to subhaplogroups L2a, L2b, and L2c. L3, the most frequent haplogroup among the Anson Street Ancestors, was characterized by a large cluster of individuals

TABLE 2 MtDNA haplogroup identification based on the mitogenome sequences of the Anson Street Ancestors

Name	ID	Skeletal element	mtDNA haplogroup	Call confidence	Coverage	Contamination (%)
Banza	CHS01	Right petrous	L3e3b1	0.9755	232×	2.5
Ola	CHS02	Left humerus	-	-	-	-
Lima	CHS03	Left petrous	L3b3	0.9505	194×	2.2
Kuto	CHS04	Left petrous	L2a1a2	0.9936	142×	3.5
Yawo	CHS05	Phalanx (second to fourth)	-	_	-	-
Babatunde	CHS06	Right third metatarsal	L3b2a	0.9699	243×	2.8
Leke	CHS07	n/a	-	-	-	-
Mbangi	CHS08	Right fourth metacarpal	L3d5a	0.9808	48×	2.2
Anika	CHS10	Left petrous	L2b1	0.9564	235×	1.8
Nana	CHS11	Right petrous	L2b3a	0.9655	265×	3.4
Ulume	CHS12	Left mandibular canine	L3f1b + 16292	0.9632	114×	3.1
Zimbu	CHS13	Left petrous	L3e1e	0.9477	222×	2.4
Juba	CHS14	Left maxillary canine	L1b1a9	0.9688	362×	3.7
Talata	CHS15	Left mandibular second premolar	L2a1c	0.9692	418×	3.6
Wuta	CHS16	Right petrous	L3e2b + 152	0.9762	108×	2.6
Daba	CHS17	Right maxillary third molar	L2c	0.9481	161×	1.9
Omo	CHS18	Rib fragment	-	-	-	-
Fumu	CHS19	Left petrous	L3e2b + 152	0.9711	75×	2.6
Nina	CHS20	Petrous fragment	L2b1b	0.9558	141×	2.9
Kwebena	CHS21	Left petrous	L1b2	0.8351	31×	4.2
Lisa	CHS22	Petrous fragment	H100	0.8591	168×	3.9
Ganda	CHS23	Left petrous	L1c1c	0.8477	162×	2.6
Coosaw	CHS24	Right petrous	A2	0.9692	208×	2.6
Kiana	CHS25	Petrous fragment	L1c3a1b	0.9327	153×	1.6
Risu	CHS26	Right petrous	L1b3	0.9222	105×	2.3
Amina	CHS27	Left petrous	U6a5	0.9959	82×	3.2
Kidzera	CHS28	Petrous fragment	L2a1a2c	0.9651	221×	2.8
Pita	CHS29	Left petrous	L3e2b	0.9181	212×	2.5
Ori	CHS30	Metatarsal fragment	-	_	-	-
Tima	CHS31	Right petrous	L3e1e	0.9888	180×	1.9
Rere	CHS32	Left petrous	LOa1	0.8238	57×	2.6
Jode	CHS33	Petrous fragment	L2a1a2c	0.9750	218×	1.7
Ajana	CHS34	Petrous fragment	L2a1i	0.9782	169×	1.8
Pele	CHS35	Right petrous	L1b1a3	0.9664	81×	1.3
lsi	CHS36	Left petrous	L3e2a	0.9749	159×	1.8
Welela	CHS37	Right maxillary third molar	L3e2a	0.9749	283×	1.8

Note: MtDNA haplogroup calls and call confidence values were generated using Haplogrep 2.0, and contamination estimation using Contamix.

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having L3e mtDNAs, with other mtDNAs belonging to subhaplogroups L3b, L3d, and L3f. The haplogroup H100, U6, and A2 mtDNAs were positioned in a separate branch from those belonging to haplogroup L, although mutationally distant from each other within it.

When haplogroup L and U6 mtDNAs from the Anson Street Ancestors were phylogenetically compared with those from reference individuals living in 55 different geographic locations across Africa (-Figure S4.1), they were mainly affiliated with individuals found in the continent's western and central regions (Figure 10). In addition, the haplotypes of the Anson Street Ancestors usually differed from those of comparative modern populations, either clustering together with those of other Ancestors or outside of the defined clade (haplogroup) to which their mtDNAs belonged (Figure 10a; Figure S4.2). For a more expansive discussion of the phylogenetic distribution of the Anson Street Ancestors, see Section S4.1 and Figures S4.1–10.

We also noted an overlap in the haplogroups appearing in the Anson Street Ancestors and those observed in other 17th and 18th century African individuals. In 18th century individuals from upstate New York, two out of the four reported African haplogroups, L2b1 and L3e2b, also occurred in the Anson Street Ancestors (Lee et al., 2009). In addition, L3e1e mtDNAs identified in *Zimbu* (CHS13) and *Tima* (CHS31) were also observed in an 18th century liberated African community in St. Helena (Sandoval-Velasco et al., 2019). More recently, subhaplogroups L2b1 and L3e1 were found in three of the Anson Street Ancestors were identified in African individuals from 16th century Mexico (Barquera et al., 2020).

Interestingly, two individuals did not possess clearly definable African mtDNAs. *Lisa* (CHS22) had a mitogenome intially defined as belonging to haplogroup H100, a subbranch of haplogroup H which arose in West Eurasia (Loogvali et al., 2004; Richards, Macaulay, Bandelt, & Sykes, 1998). Back migrations from Eurasia into Africa during the Neolithic spread haplogroup H into North Africa (Kulichová et al., 2017; Ottoni et al., 2010). Subsequent expansions of seminomadic pastoralist groups, such as the Tuareg or the Fulani, from North Africa likely brought this lineage to regions of Africa that were the focus of the trans-Atlantic slave trade (Kulichová et al., 2017).

In this regard, an analysis of H1 mtDNAs in Fulani populations from across the Sahel revealed the new subhaplogroup H1cb1a (Kulichová et al., 2017) which displayed phylogenetic similarities to *Lisa's* H100 mtDNA. We conducted a reduced-median joining network analysis of *Lisa's* haplotype and those of 24 other individuals having H1cb1a and H1cb1a1 mtDNAs (Figure 11). This analysis indicated that *Lisa's* H100 haplotype was identical to three other H1cb1a haplotypes in Fulani populations from Niger, Burkina Faso and Guinea. In fact, *Lisa's* haplotype formed the internal node from which the other H1cb1a haplotypes branched off. These findings clearly indicate that *Lisa's* mtDNA was of African derivation and belonged to haplogroup H1cb1a.

The mtDNA of another individual, *Coosaw* (CHS24), belonged to haplogroup A2. Populations carrying A2 mtDNAs originated in Beringia around 16 kya, and dispersed throughout the Americas during the initial peopling of these continents (Llamas et al., 2016; Schurr & Sherry, 2004; Vilar et al., 2014; Volodko et al., 2008). Today, it is found at moderate to high frequencies in various indigenous populations in the Americas (Achilli et al., 2008; Schurr & Sherry, 2004). This finding indicates that either persons of Indigenous descent were buried at Anson Street or admixture between people of African and Indigenous descent occurred in *Coosaw's* family tree.

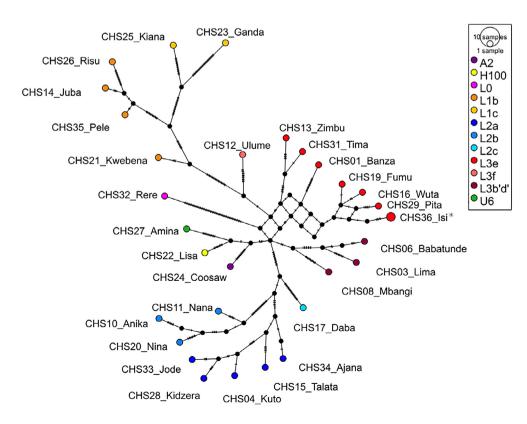
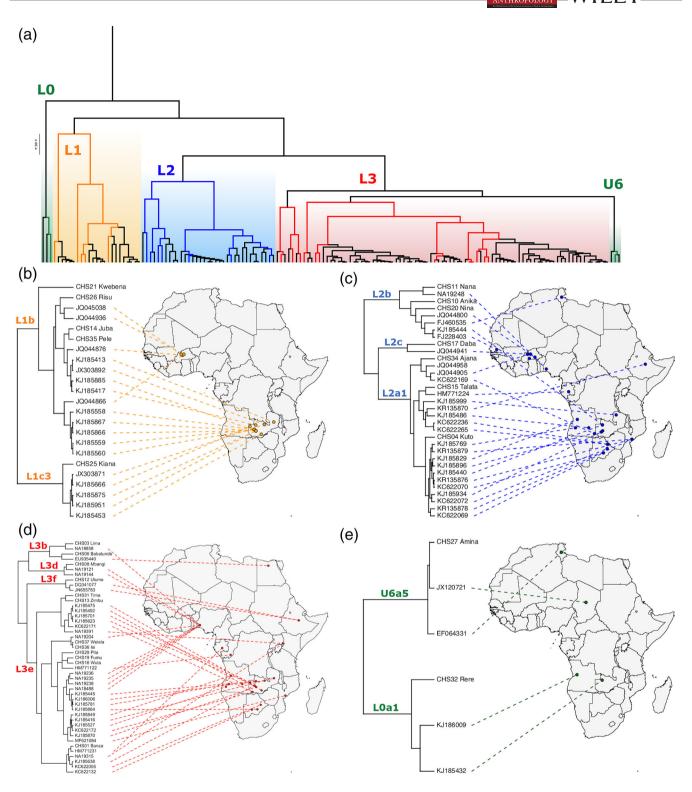


FIGURE 9 Reduced Median-Network analysis of the Anson Street Ancestors' mitogenome sequences. The color of the nodes indicates the mitochondrial DNA haplogroup designations, and number of the tick-marks between branches indicates the relative mutational distance between them. The asterisk (\*) following the label "CHS36\_Isi" indicates that this node also includes "CHS37\_Welela," who has an identical haplotype

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**FIGURE 10** The phylogenetic distribution of the Anson Street Ancestors' mitogenome sequences in relation to contemporary reference populations in Africa. (a) Phylogenetic tree of the African mitogenome sequences (n = 28), not including H100 or haplotypes with lacking associated reference individuals, in relation to contemporary reference individuals in Africa. Clade coloring is indicative of haplogroup designations, and colored branches indicate an Anson Street Ancestor haplotype; (b) Phylogenetic tree of L1 mitogenome sequences with reference individuals (n = 18) mapped onto their approximate geographic location in Africa; (c) Phylogenetic tree of L2 mitogenome sequences, with a subset of reference individuals (n = 26) mapped; (d) Phylogenetic tree of L3 mitogenome sequences, with a subset reference individuals (n = 33) mapped; (e) Phylogenetic tree of L0 and U6 mitogenome sequences, with reference individuals (n = 4) mapped

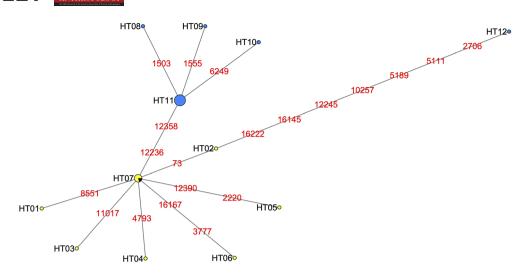


FIGURE 11 Reduced-Median network analysis of *Lisa's* (CHS22) H100 mitogenome haplotype and associated H1cb haplotypes as described by Kulichová et al. (2017). Yellow nodes indicate H1cb1a haplotypes, with the black slice representing the ancient DNA sample, and blue nodes represent haplotypes described as H1cb1a. Nodes are scaled to frequency within the sample group. Numbers along branches represent mtDNA variants. Haplotypes (HT) designations are as follows: HT01: KY923847–Fulani (Mali); HT02: KY923845–Songhai (Mali); HT03: KY923842–Fulani (Burkina Faso); HT04: KY923850–Fulani (Burkina Faso); HT05: KY923841–Fulani (Niger); HT06: KY923843–Fulani (Chad); HT07: CHS22–*Lisa* (this study), KY923844–Fulani (Niger), KY923846–Fulani (Niger), KY923848–Fulani (Guinea), KY923851–Fulani (Burkina Faso); HT08: KY923834–Fulani (Mali); HT09: KY923836–Fulani (Burkina Faso); HT10: KY923833–Fulani (Burkina Faso); HT11: KY923831–Fulani (Mali), KY923832–Fulani (Mali), KY923835–Fulani (Burkina Faso), KY923837–Fulani (Burkina Faso), KY923837–Fulani (Burkina Faso), KY923838–Fulani (Chad), KY923839–Fulani (Mali), KY923840–Fulani (Burkina Faso), KY923837–Fulani (Burkina Faso), KY923837–Fulani (Burkina Faso), KY923840–Fulani (Burkina Faso), KY923853–Fulani (Burkina Faso), KY923837–Fulani (Burkina Faso), KY923838–Fulani (Chad), KY923839–Fulani (Burkina Faso), KY923840–Fulani (Burkina Faso), KY923853–Fulani (B

Two of the Anson Street Ancestors exhibited identical mitogenome sequences, suggesting they shared direct maternal ancestry. These individuals, *Isi* (CHS36), an adult, and *Welela* (CHS37), a 6–8-year-old child, shared a L3e2a haplotype (Table 2; Table S8). This is the first aDNA report of 17th–18th century African-descended individuals having identical mtDNA haplotypes, hence, potential biological kinship between them.

### 5 | DISCUSSION

The bioarchaeological and mitogenome analysis of the Anson Street Ancestors represents the first comprehensive archaeogenetic investigation of 18th century African-descended individuals in the South, and complements the initiatives of the New York African Burial Ground Project in the North. An expanded osteobiographical approach incorporating ancient DNA and isotopic information has provided insights into the lived experiences of Anson Street Ancestors, and revealed complexities in their maternal ancestry, mobility, and health (summarized in Table 3). Bioarchaeological analyses indicated the presence of males, females, and subadults, with ages ranging from six months to over 40 years, thus revealing a wide demographic profile of the persons interred at Anson Street. Mitogenome, osteological, and strontium stable isotopic evidence was consistent with African ancestries for the majority of the Anson Street Ancestors.

Given the lack of documentary information about their identities, the exact social standing of the Ancestors is unknown. By A.D. 1790, the population of free blacks in Charleston was only 3.6%, in a city with an enslaved black population representing 47% of its residents (Powers, 1994, p. 267). However, during the burial ground's estimated period of interment (A.D. 1760–1790), plat records indicate that it was situated on privately owned property of a white Charlestonian, with no known burial ground for free people of color documented in the area (Trinkley et al., 2010). Thus, the internment period, location, and population demographics suggest that the Anson Street Ancestors were likely of enslaved status.

### 5.1 | Ancestry

Mitogenome sequence analysis provides insights into the diverse maternal ancestries of African-descended persons in Charleston, and by extension the expansiveness of the trans-Atlantic slave trade during the 18th century. The majority of the Anson Street Ancestors have mitogenome haplogroups affiliated with those of present-day populations living in Central and West Africa. This finding is consistent with documentary records indicating that the majority of persons brought to Charleston were forcibly taken from these regions in the trans-Atlantic slave trade during this period (Kolchin, 2003; Littlefield, 1981; McMillin, 2004; P. Wood, 1974). It is also supported by the enamel strontium isotope evidence, which indicates that six individuals display profiles that overlap with regions in West Africa.

When compared to other published mtDNA data for historic period African descended individuals, there is a notable overlap in haplogroup sharing. Of the 42 individuals for whom published data are available, 12 share derived haplogroups with the Anson Street Ancestors (Barquera et al., 2020; Fleskes et al., 2019; Lee et al., 2009; burial

TABLE 3 Summary table of the individual profiles for the Anson Street Ancestors, consisting of mitogenome estimations of ancestry, osteological demographic estimations of age and sex, strontium enamel and bone mobility estimation, and archeological artifacts found with each

		Mitogenome	Osteology		Strontium significant deviation from group mean suggesting nonlocal (Y/N)		Archaeology	
Name	ID	Ancestry	Age	Sex	Enamel	Bone	Artifacts	
Banza	CHS01	Sub-Saharan Africa	Young adult	Male	Y	N	Buttons	
Ola	CHS02	N/A	Adult	-	N/A	Ν	Nail, ceramic	
Lima	CHS03	Sub-Saharan Africa	Middle adult	Male	N	N	-	
Kuto	CHS04	Sub-Saharan Africa	Older adult	N/A	Y	Ν	Pins, ceramic	
Yawo	CHS05	N/A	Adolescent	N/A	N	-	-	
Babatunde	CHS06	Sub-Saharan Africa	Adult	N/A	N/A	Ν	-	
Leke	CHS07	-	Adult	N/A	-	-	-	
Mbangi	CHS08	Sub-Saharan Africa	Middle adult	Male	Ν	-	Button, nail, ceramic	
Anika	CHS10	Sub-Saharan Africa	Young adult	Female	N	Ν	-	
Nana	CHS11	Sub-Saharan Africa	Young adult	Female	Ν	Ν	Pin, ceramic	
Ulume	CHS12	Sub-Saharan Africa	Adult	N/A	N	N	Stone bead	
Zimbu	CHS13	Sub-Saharan Africa	Middle adult	Male	Y	Ν	-	
Juba	CHS14	Sub-Saharan Africa	Middle adult	N/A	Ν	Ν	Copper coin, buttons, iron utensil fragment, ceramic	
Talata	CHS15	Sub-Saharan Africa	Adult	N/A	Y	Ν	Nail	
Wuta	CHS16	Sub-Saharan Africa	Adult	N/A	Ν	Ν	Button shank, ceramic	
Daba	CHS17	Sub-Saharan Africa	Adult	Male	Y	Ν	Button, ceramic	
Omo	CHS18	-	Infant	N/A	Ν	N/A	Pin, glass bead	
Fumu	CHS19	Sub-Saharan Africa	Middle adult	Male	Ν	Ν	Pipe bowl fragment	
Nina	CHS20	Sub-Saharan Africa	Adolescent	N/A	Ν	Ν	Nails, ceramic	
Kwebena	CHS21	Sub-Saharan Africa	Middle adult	Male	Ν	Ν	Buttons, lead object, ceramic	
Lisa	CHS22	Sub-Saharan Africa	Young adult	Female	Ν	Ν	-	
Ganda	CHS23	Sub-Saharan Africa	Adult	N/A	Y	Y	Spall gun flint, buttons, ceramic	
Coosaw	CHS24	Americas	Adolescent	Female	Ν	Ν	Buttons	
Kiana	CHS25	Sub-Saharan Africa	Child	N/A	Ν	N/A	Pin	
Risu	CHS26	Sub-Saharan Africa	Adult	Male	Ν	Ν	Pipe bowl fragment, nail, pin, ceramic	
Amina	CHS27	North Africa	Adult	N/A	Ν	Ν	Iron object	
Kidzera	CHS28	Sub-Saharan Africa	Infant	N/A	Ν	N/A	Ceramic	
Pita	CHS29	Sub-Saharan Africa	Adult	N/A	Ν	Ν	Pin, button	
Ori	CHS30	N/A	Adult	N/A	N/A	Ν		
Tima	CHS31	Sub-Saharan Africa	Adult	Female	Ν	Ν	Nail	
Rere	CHS32	Sub-Saharan Africa	Adult	N/A	N/A	N		
Jode	CHS33	Sub-Saharan Africa	Child	N/A	Ν	N/A	Nails, pin	
Ajana	CHS34	Sub-Saharan Africa	Adult	N/A	N/A	N		
Pele	CHS35	Sub-Saharan Africa	Older adult	N/A	Ν	Ν		
lsi	CHS36	Sub-Saharan Africa	Adult	N/A	N	N	Pins, ceramic	
Welela	CHS37	Sub-Saharan Africa	Child	N/A	Ν	N/A	Two halfpennies, buttons, iron button shank	

Note: Biological sex estimation based on osteological assessments of dentition and postcranial elements based on availability; N/A values indicate remains were too fragmentary or of juvenile status for accurate sex estimation, or failed strontium isotopic testing. Dashes indicate that the data were not available due to preservation, or in the case of the archeological artifacts, not present.

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Sandoval-Velasco et al., 2019; Santana et al., 2016; Schroeder et al., 2015). This observation suggests similarities in the maternal ancestries of populations living in regions targeted during the trans-Atlantic slave trade.

The diversity of mtDNA haplogroups present among the Anson Street Ancestors enlarges our understanding of the maternal ancestry of enslaved Africans in North America. Their mitogenomes belong to 24 different African haplogroups and 27 distinct haplotypes. In addition, two individuals have non-L haplogroups of African derivation, with Lisa's (CHS22) H1cb1a mtDNA representing a derived African sublineage of a Eurasian haplogroup H, and Amina's (CHS27) U6a5 mtDNA being of North African origin. Although North Africa's direct involvement in the trans-Atlantic slave trade is thought to have been marginal (Klein, 2010), this finding could indicate the genetic influence of North African populations on West-Central African populations due to intercontinental movements such as the trans-Saharan trade (Wright, 2007).

Evidence of Native American ancestry in the Ancestors was also observed. A single individual, Coosaw (CHS24), had a mitogenome belonging to haplogroup A2, a lineage common in Native American populations. Strontium isotope evidence for Coosaw also suggests she had long term residency in the local area. The presence of indigenous mtDNA lineages in the Anson Street Ancestors is not entirely surprising, as Native persons interacted with both enslaved and free Africans throughout the colonial period (Snyder, 2010).

In addition, shovel shaped incisors were observed in three individuals, including Wuta (CHS16), Nina (CHS20), and Jode (CHS33), although interestingly not Coosaw. Of the three individuals with incisor shoveling, all have African-derived mtDNAs. Yet, their enamel and bone strontium isotope values are not significantly derived from the population mean, indicating they were likely born and resided in the local area. These observations suggest that either their incisor shoveling derives from having African population ancestry, or these individuals have some degree of indigenous ancestry undetectable through mitogenome sequencing. Forthcoming genomic analysis will help distinguish between these alternative possibilities and clarify the extent of indigenous ancestry in Coosaw.

#### 5.2 Mobility

Strontium stable isotopic analysis elucidated mobility patterns for the persons interred at the ASABG. Enamel values suggest that a minimum of six individuals, mostly males, were forcibly transported to Charleston through the Middle Passage during their lifetimes. However, when sub-adults were included, more than half of the burials fall within 1  $\sigma$  of the group mean, indicating similar mobility or dietary patterns during their childhoods that likely resulted from living in the local Charleston area. Cortical bone strontium values are also highly similar among the majority of the Anson Street Ancestors, suggesting comparable mobility over the last 10 years of life. Only one individual, Ganda (CHS23), has both cortical and enamel isotope values that significantly deviated from the population mean and fell within published strontium isotopic values in Africa. This result suggests that he spent his developmental years in Africa and resided locally in Charleston for a short period of time before his passing.

In this regard, if this burial ground had been used to inter enslaved African persons who recently arrived in Charleston, then we might expect to observe a more heterogenous and possibly more radiogenic sample of strontium values in both enamel and bone. The lack of heterogeneity in these samples suggests that the majority of the Anson Street Ancestors either resided in Charleston since birth or for a significant period of time before death. However, the possibility that they previously lived in a location with overlapping biologically available strontium values, such as the Caribbean, cannot be entirely eliminated.

#### 5.3 Lived experience

Osteological and archeological evidence informs the lived experiences of the Anson Street Ancestors, including their health and activity patterns. While the majority of the Anson Street Ancestors displayed no skeletal indicators associated with chronic or heavy labor, osteological changes due to repetitive muscle use, injuries, or lesions were noted in four individuals: Lima (CHS03), Kuto (CHS04), Mbangi (CHS08), and Fumu (CHS19). This pattern differs from other osteological studies of 18th and 19th century enslaved Africans in plantations settings, where a majority of individuals exhibit a high degree of joint degeneration and nutritional stress (Handler & Corruccini, 1983: Rathbun, 1987).

The Anson Street Ancestors also suffered from poor dental health. The frequency of dental wear, lesions, tooth abscesses and loss were relatively high among the Ancestors and comparable to that of other 17th and 18th century enslaved Africans in North America and the Caribbean (Corruccini et al., 1982; Owsley et al., 1987; Rathbun, 1987), but lower than the frequency observed in the New York African Burial Ground (Mack et al., 2009). This may indicate the poor quality of dental care or the high consumption of starches characteristic of diets during this period (Medford, Brown, Carrington, Heywood, & Thornton, 2009). Thus, Charleston's urban context may have influenced activity patterns relative to rural settings, but overall oral health, access to nutritional foods, and dental care remained poor for those interred at Anson Street.

Dental modifications provide additional clues about activity patterns for certain individuals. Pipe wear facets appear in the teeth of Kwebena (CHS21), Pita (CHS29), Tima (CHS31), and Fumu (CHS19), with the latter being buried with clay pipe fragments. These distinctive facets have been identified in other colonial-era individuals (Ubelaker, 1996), including African individuals in the Chesapeake (Fleskes et al., 2019) and Barbados (Corruccini et al., 1982). These observations attest to the habitual practice of smoking tobacco by some of the Anson Street Ancestors and other African persons in the Americas.

In addition, Anika (CHS10) displays a dental modification that could be attributed to processing fibrous materials between the front

central incisors. While being similar to cultural dental modification patterns in sub-Saharan African populations (Haour & Pearson, 2005; Irish, 2017; Wasterlain et al., 2016), such a practice has not been commonly recorded for African populations living in the Americas (Irish, 2017). Given that this young adult female's enamel and cortical bone strontium isotope values are highly similar to those of other Anson Street individuals, suggesting that she was local to the area, this modification likely resulted from Anika using her teeth as a tool.

The filed maxillary incisors of *Ganda* (CHS23) provide further insights into the origin of cultural dental modifications of enslaved African individuals. Classically, cultural dental modifications for colonial era African individuals have been interpreted as an indicator that they were born in Africa (Handler et al., 1982). At least one mention of this type of dental modification was reported in a 18th century Charleston newspaper posting for captured runaway slaves ("Brought to the work-house", 1770), and it has also been identified in individuals from the New York African Burial Ground (Goodman et al., 2009). While such modifications were, and to some degree still are, practiced in Africa (Irish, 2017), the extent to which this practice was continued by enslaved Africans in the Americas has been debated (Handler et al., 1982; Schroeder et al., 2014; Stewart & Groome, 1968).

Schroeder et al. (2014) investigated this issue by analyzing enamel strontium isotopes in three 17th century African individuals who were buried on the Caribbean island of Saint Martin and had culturally modified teeth. In finding African derived isotope profiles for these individuals, they argued that the changed social and lived realities of enslavement likely discouraged the practice of cultural dental modifications in the Americas. However, enamel strontium isotope results from the New York African Burial Ground indicate that individuals with culturally modified teeth were not always born in Africa (Goodman et al., 2009). Therefore, while the overlap of *Ganda's* (CHS23) high enamel and bone strontium ratio with those for individuals from West Africa lends support to the conclusion that his dental modification was likely performed there, this may not always be the case for other individuals with cultural dental modifications who lived in North America and the Caribbean.

### 5.4 | Kinship

Mitogenome sequencing revealed that *Isi* (CHS36) and *Welela* (CHS37) possess the same mtDNA haplotype, suggesting that they shared direct maternal ancestry. Although it is possible that these individuals share the same haplotype by chance, the bioarchaeological context of the burials suggests otherwise. Osteological assessments of age indicate that *Isi* was an adult and *Welela* was a 6–8-year-old child at the time of their deaths. Both their strontium enamel and cortical bone isotopic values are similar to the group mean, suggesting they likely resided in the local area during their developmental years, and *Isi* into adulthood. In addition, the burials for *Isi* and *Welela* was discovered to have two George III copper half pennies covering the eyes.

The placement of the halfpennies was an intentional act by another living person, and is common in many burial traditions to keep the eyes closed (Combes, 1972; Puckle, 1926). Such a practice has also been noted in two First African Baptist Church burials (McCarthy, 2006; Rankin-Hill, 1997), as well as a 19th century burial in South Carolina (Jamieson, 1995). Ongoing autosomal DNA analyses will determine the nature of the biological relationship between *lsi* and *Welela*, as well as help to elucidate the extent of shared biparental ancestry among the other Anson Street Ancestors.

The overall lack of biological maternal kinship within the ASABG is similar to findings for other aDNA studies of colonial era Africandescended persons (Barquera et al., 2020; Fleskes et al., 2019; Lee et al., 2009: Sandoval-Velasco et al., 2019: Schroeder et al., 2015). This finding clearly reflects the violence enacted in the separation of families during the lived process of enslavement, as previously documented (Berlin, 2009; Pargas, 2009). However, it does not obviate other nonbiological connections and evidence of community appearing in the archeological record (Blouet, 2013; McCarthy, 2006). Grave organization and the presence of coffin hardware argue for the intentionally of the interments for these individuals, with care taken to bury them by a defined community. The presence of grave goods, such as a coin buried with Juba (CHS14) or clav tobacco pipe fragments with Risu (CHS26) and Fumu (CHS19), demonstrates the materiality of care through objects of remembrance. The practice of placing a single coin in a coffin has previously been reported in other African graves in the Americas, as well as in West Africa, where it is associated with a monetary offering for passage to the afterlife (McCarthy, 2006; Parrinder, 1961). In addition, clothing or personal adornment items were found, including the mother-of-pearl inlay button with Juba (CHS14) and the bead associated with the infant Omo (CHS18). The placement of these items with the deceased persons was an intentional act by those interring them, and suggests the presence of community or familial relationships among the Anson Street Ancestors.

## 6 | CONCLUSIONS AND FUTURE DIRECTIONS

In this article, we have presented a detailed osteobiography of the Anson Street Ancestors, who represent African-descended individuals living in 18th century Charleston, South Carolina, a city whose history is deeply entrenched in slavery. We used a multi-method approach combining mitogenome sequencing, strontium isotopes and bioarchaeological analyses to reconstruct their life histories. We were able to identify their maternal ancestry and relationships, assess migration and mobility, and describe their health and lived experiences. This research adds critical information to our understanding of Africandescended persons in 18th century North America, who were forcibly removed from their homelands during the trans-Atlantic slave trade.

Our osteobiographical approach facilitates a deeper investigation into, and remembrance of, the lives of the deceased. All 36 Anson Street Ancestors were individuals with distinctive life histories. They WILEY PHYSICAL

were mothers, survivors, children born in North America, and men who smoked tobacco. They were mourned with coins and adorned with beads in their final resting place by those who remembered them. The Charlestonian community remembered them by celebrating their lives and returning them to the ground with African names in 2019. Our use of archaeogenetic methods to elaborate their biohistories is a further act of remembrance.

This study was conducted using a community-engagement model that involved the Charlestonian African American community throughout the research process. Continual conversations with the community and reporting of research progress ensured integration of community feedback, such as the suggestion to give names to the Anson Street Ancestors. Based on these experiences, we strongly advocate for conducting community-based biological anthropology research to study historic period archeological sites.

Finally, this study represents the first of many research endeavors for the ASABG Project. Ongoing genomic analysis and documentary research will expand our understanding of the ancestries and histories of the Anson Street Ancestors, while future carbon and nitrogen isotope data and oral microbiome research will deepen our understanding of their diet and health. Furthermore, a published description of the community engagement process, including the Naming and Reinterment ceremonies, will illustrate the ways that community outreach can be effectively integrated with ancient DNA and bioarchaeological research to help answer questions about ancestry and history that are of interest to all stakeholders.

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### CONFLICT OF INTEREST

The authors declare no conflict of interest in the publication of this study.

### AUTHOR CONTRIBUTIONS

Raquel Fleskes: Conceptualization: data curation: formal analysis: funding acquisition; investigation; methodology; project administration; validation; visualization; writing-original draft; writing-review and editing. Ade Ofunniyin: Conceptualization; funding acquisition; investigation; methodology; project administration; validation; visualization; writing-original draft; writing-review and editing. Joanna Gilmore: Conceptualization; funding acquisition; investigation; methodology; project administration; validation; visualization; writingoriginal draft: writing-review and editing. Eric Poplin: Investigation: validation; writing-original draft; writing-review and editing. Suzanne Abel: Investigation; validation; writing-original draft; writing-review and editing. Wolf Bueschgen: Investigation; validation; writingoriginal draft; writing-review and editing. Chelsey Juarez: Investigation; validation; writing-original draft; writing-review and editing. Nic Butler: Investigation; validation; writing-original draft; writing-review and editing. Grant Mishoe: Investigation; validation; writing-original draft; writing-review and editing. Graciela Cabana: Funding acquisition; methodology; project administration; validation; writing-original draft; writing-review and editing. Theodore Schurr: Conceptualization; data curation; formal analysis; funding acquisition; investigation; methodology; project administration; validation; visualization; writingoriginal draft; writing-review and editing.

### DATA AVAILABILITY STATEMENT

The sequence data generated from this study are openly available in the Sequence Read Archive at https://www.ncbi.nlm.nih.gov/sra, reference number PRJNA658314. Additional data that support the findings of this study are available in Supporting Information of this article.

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### ENDNOTES

- <sup>1</sup> The total number of enslaved persons disembarked was calculated in the Slave Voyages Database by selecting the year range as 1670–1807, which represent the years of the settlement of Charleston and the year that the Act Prohibiting Importation of Slaves was enacted, and Mainland North America as the principal place of slave landing (accessed February 26, 2020). Note that the database reports only documented individuals.
- <sup>2</sup> The total number of enslaved persons disembarked was calculated in the Slave Voyages Database by selecting the year range as 1670–1807 and selecting Charleston as the principal place of slave landing (accessed February 26, 2020). Note that the database reports only documented individuals.
- <sup>3</sup> Àse is an African philosophical concept through which the Yoruba of Nigeria conceive the power to make things happen and produce change (Vega, 1999).

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Additional supporting information may be found online in the Supporting Information section at the end of this article.

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