

The geochemical profile of the Woman in the Iron Coffin (Queens, New York City)



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This Is Not a Crime Scene

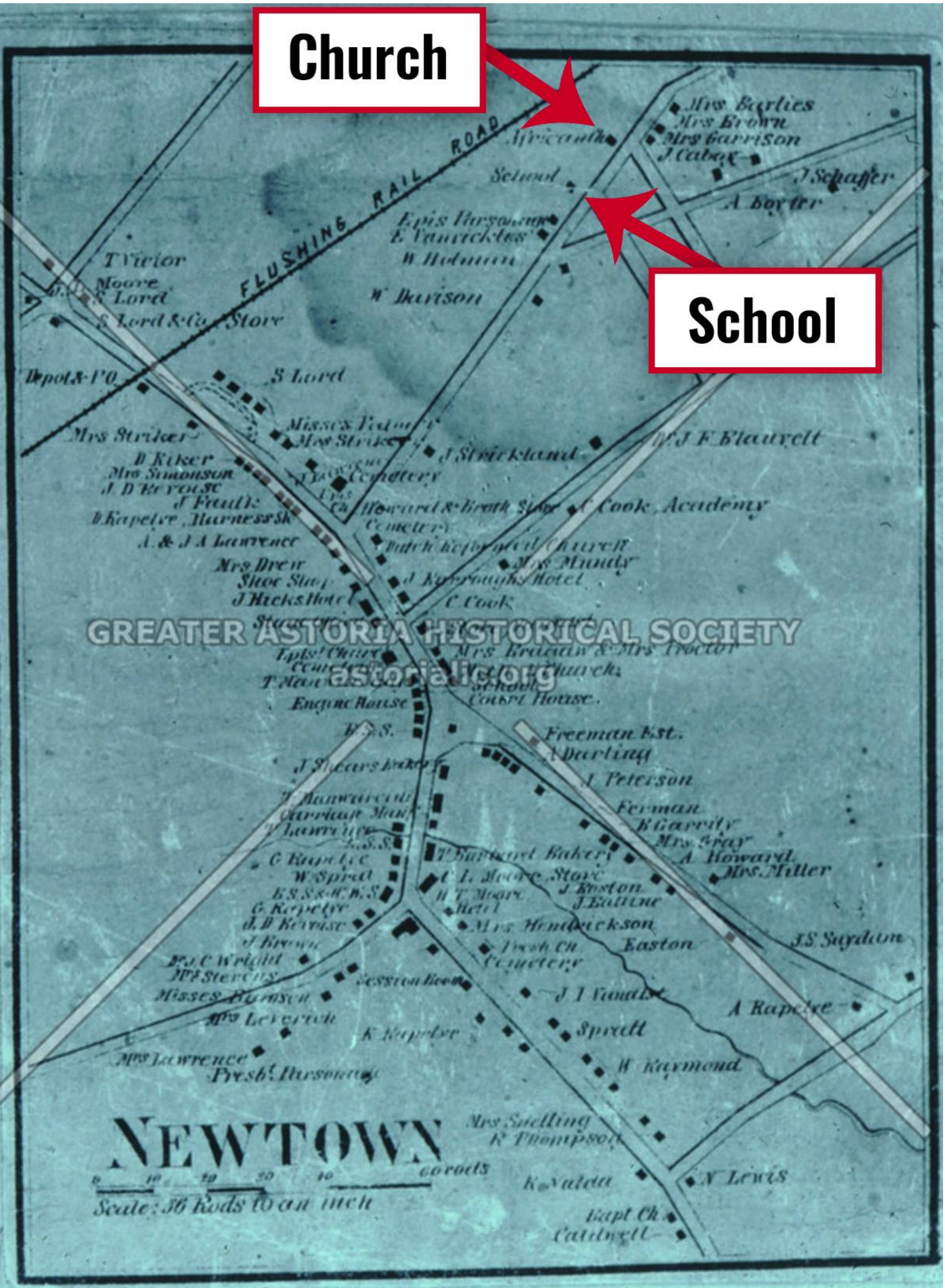


On November 4, 2011, an illegal construction excavation encountered a body in a vacant lot in Elmhurst, Queens. The construction workers, believing they had unearthed a recently buried homicide victim, fled the site and reported the discovery to the police (Warnasch, 2011). The following day, members of the Forensic Anthropological Unit of the NYC Office of Chief Medical Examiner's (OCME) responded to investigate the scene. While approaching the body, they discovered the shattered fragments of a mid-19th century, cast-iron coffin, suggested that the property had previously been a burial ground and the body was much older than originally assumed.

The individual interred in the iron coffin was identified as an adult African-American female, approximately 5'2" tall, and based on the lesions observed on her well-preserved skin, had likely died of smallpox. Radiographs, CT and MRI scans of the woman's skeleton revealed epiphyseal fusions providing an age range of 25-30 years at the time of death. The woman's excellent state of preservation was due to the Fisk iron coffin in which she was buried. The coffins, manufactured between 1848 and 1854, were specifically designed to naturally preserve corpses as a sanitary means of transporting and storing bodies prior to the widespread practice of embalming. The coffins gained popularity beginning with the funeral of former first lady Dolley Madison in 1849. Several other politicians quickly followed including President Zachary Taylor, Henry Clay and Daniel Webster. Expensive and practical in the early decades of steam travel, the coffins also served as a means of quarantining victims of contagions, while still allowing for a public funeral. The discovery raises several questions regarding how an African American woman during the time of slavery came to be buried in a manner hitherto available to white elites.



Who Was the Woman in the Iron Coffin?



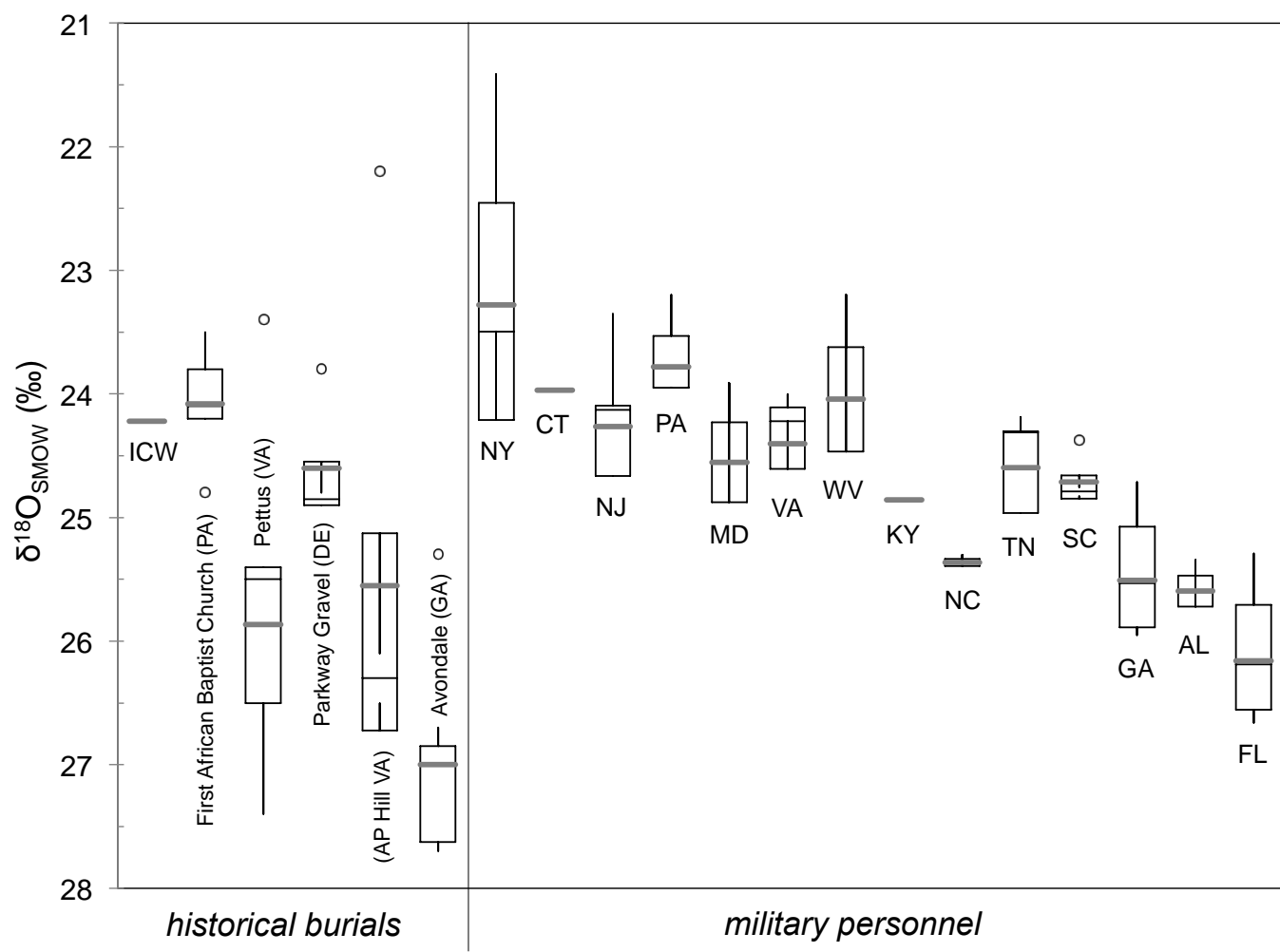
Archival research by SCW found that the area of Queens during the mid-19th century was known as Newtown. Town officials had designated the property where the woman's body was discovered as an African burial ground in 1818 (Newtown Register, 14 Oct 1886). The property was located along Dutch Lane, now Corona Ave., about a quarter of a mile from town center. In 1828, one year after New York state abolished slavery, the property was purchased by a local benevolent society called the United African Society of Newtown to establish the first Black church in the area. The names of the purchasers listed on the deed were: John Peterson, President; George Darling, Vice President; John Coles, Treasurer; and John Potter, Secretary.

Genealogical triangulation by SCW is highly suggestive that the woman in the iron coffin was Martha Peterson, the daughter of one of the five patriarchs of the Petersons, a large, property-owning free Black family in Newtown. The image to the left is a forensic reconstruction of Martha Peterson.

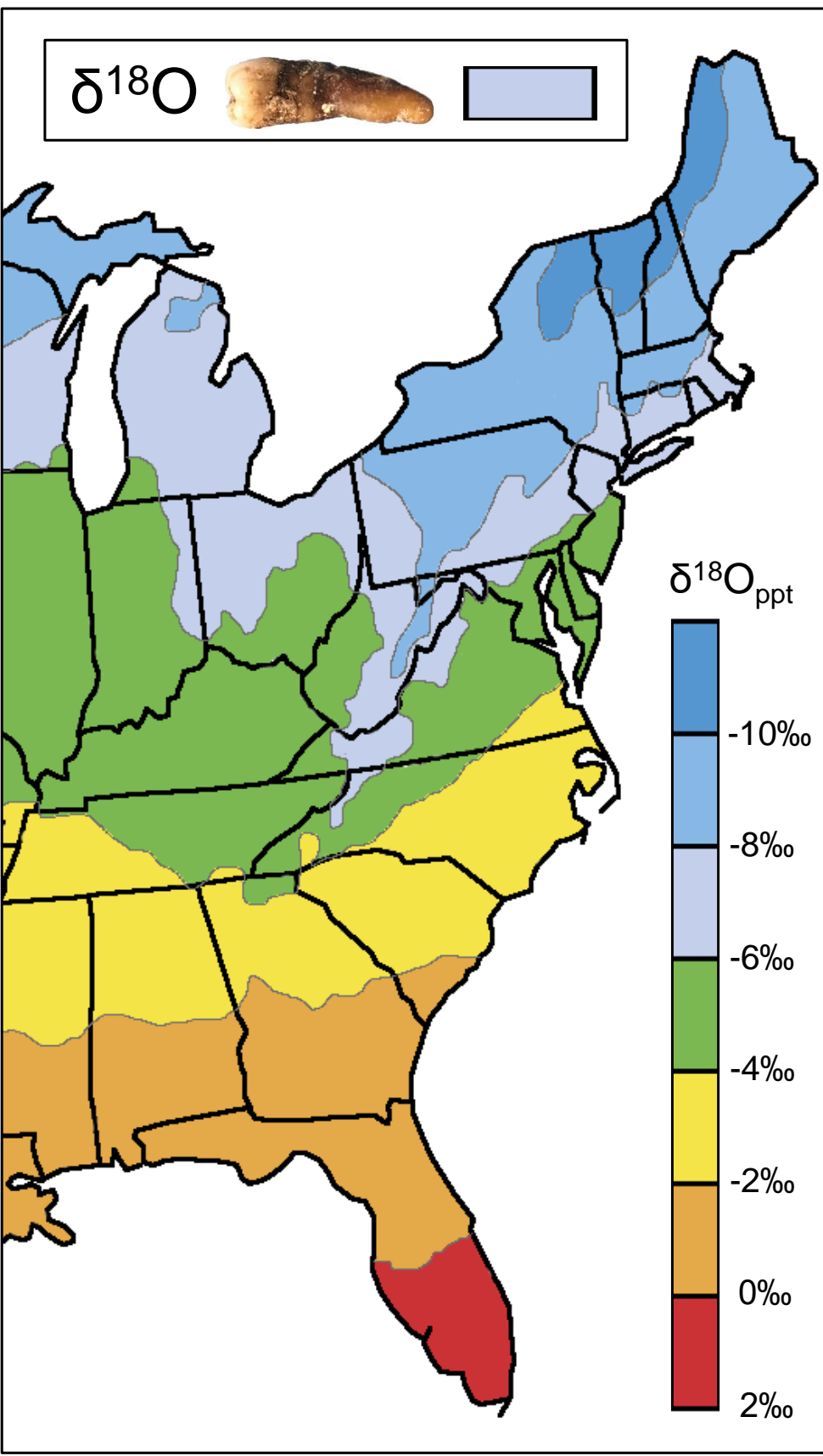


Testing Identity with Residential History

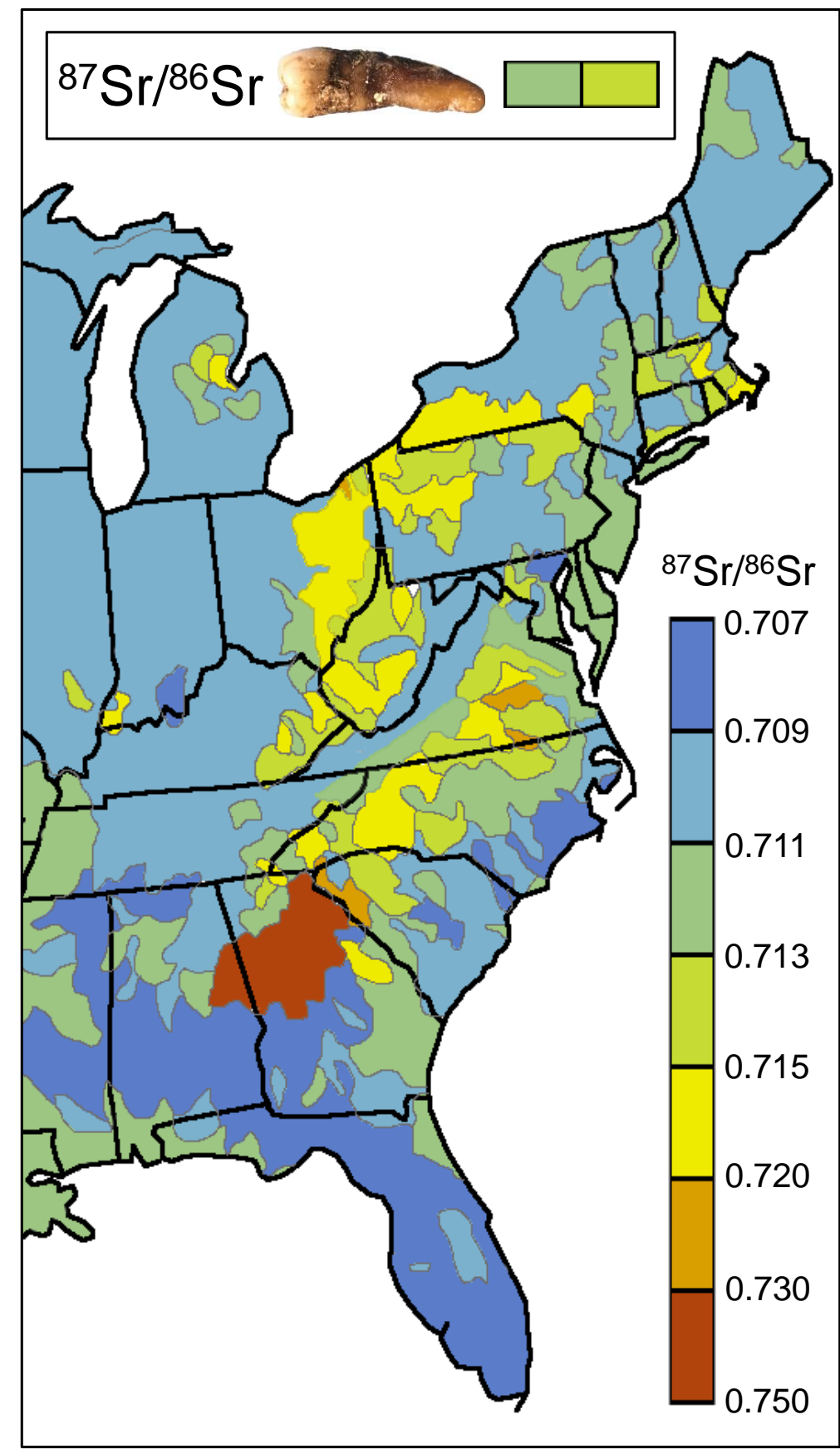
In this study, we applied geochemical techniques to test the archival-based identification of the Woman in the Iron Coffin (denoted ICW). We reconstructed geographic residence, diet and aspects of health with several isotopic and elemental systems of two tissue types made available by the Centers for Disease Control. We report three isotopic values ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$, $^{87}\text{Sr}/^{86}\text{Sr}$) and four elemental concentrations (As, Sr, Pb, U) from the left second premolar and two isotopic values ($\delta^{13}\text{C}$, $\delta^{15}\text{N}$) from one strand of hair from ICW in order to aid in identification and reconstruct her past lifeways. We compared our results to established US $\delta^{18}\text{O}$ and $^{87}\text{Sr}/^{86}\text{Sr}$ isoscapes to determine geographic location during the time of tooth formation. We also gauge diet and health with $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of hair and with $\delta^{13}\text{C}$, Pb Sr, and As of tooth enamel.



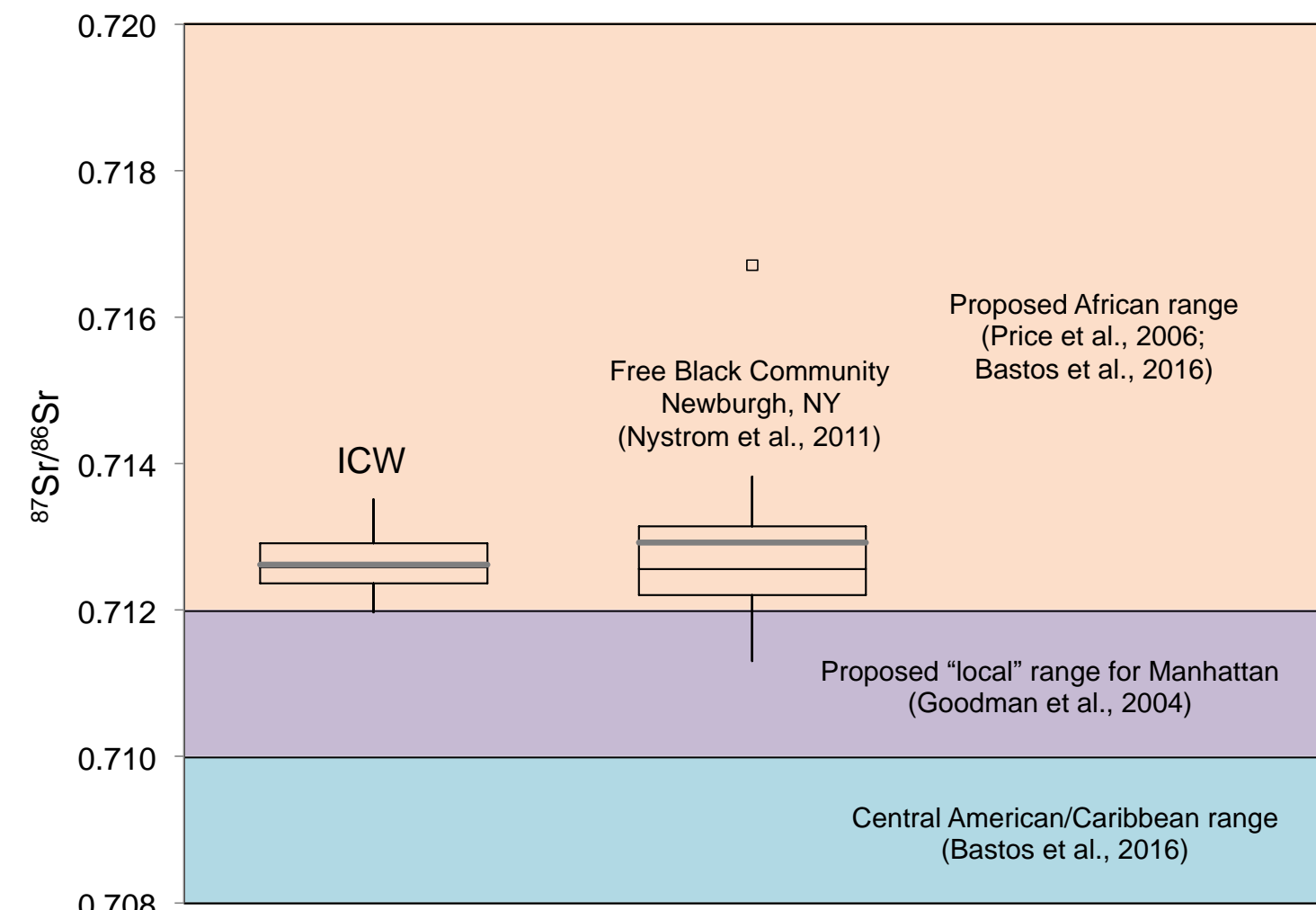
ICW's $\delta^{18}\text{O}$ value is statistically higher (One-way ANOVA, $p < 0.05$) than military personnel from southern states (GA, AL, FL) and comparable to individuals from mid-Atlantic and northeastern states (NY, CT, NJ, PA) (Keller et al. 2016). ICW's $\delta^{18}\text{O}$ value is comparable to those of African and African descent burials from PA (France et al., 2014)



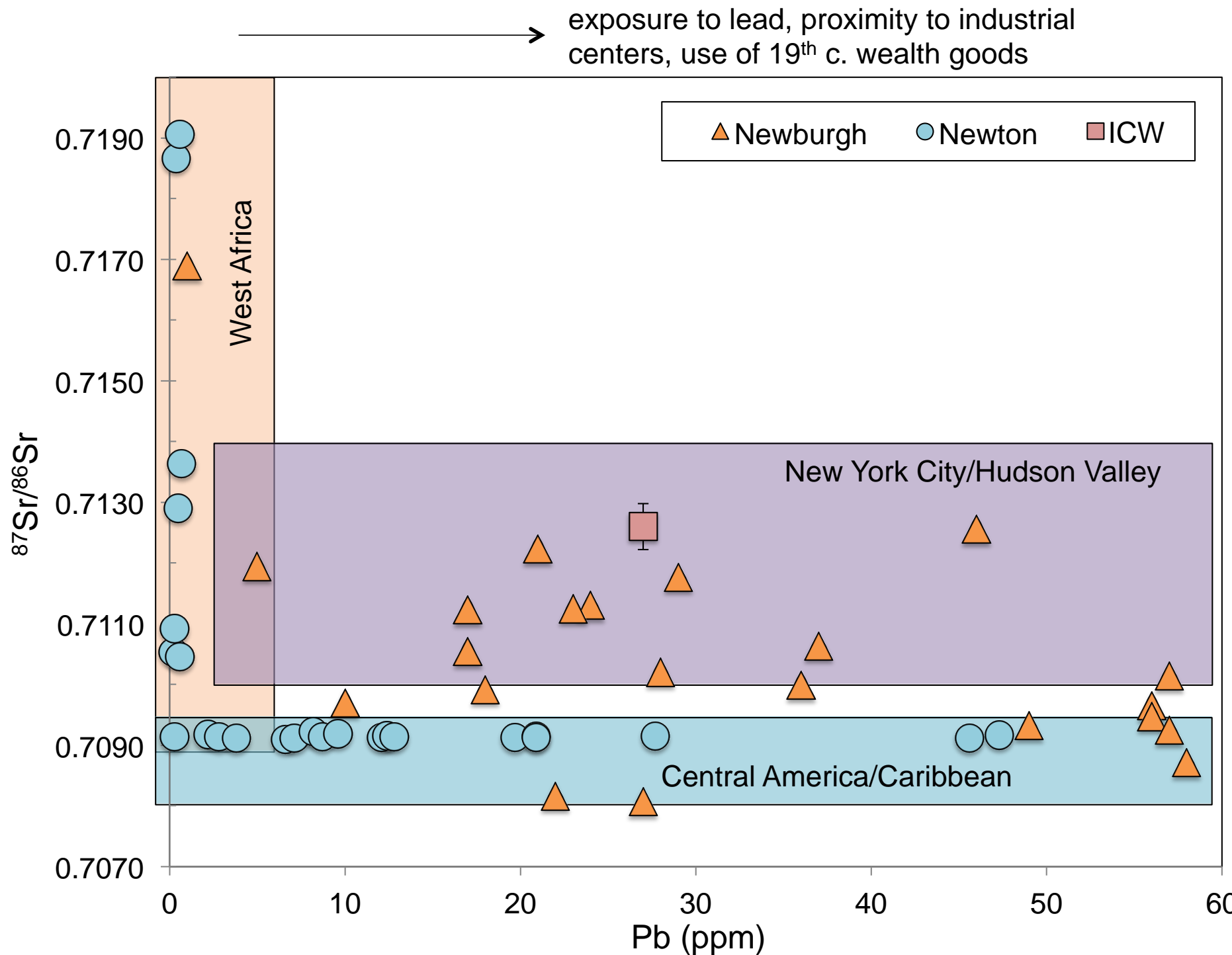
The calculated $\delta^{18}\text{O}$ value of ingested water falls within the rainfall isopach that includes NYC (Dutton et al., 2005).



ICW's enamel $^{87}\text{Sr}/^{86}\text{Sr}$ values are within the $^{87}\text{Sr}/^{86}\text{Sr}$ ranges (0.711-0.713) of the region according to the $^{87}\text{Sr}/^{86}\text{Sr}$ isoscape of Bowen and Bastille (2012) based on regional geologic bedrock and tap water $^{87}\text{Sr}/^{86}\text{Sr}$ values

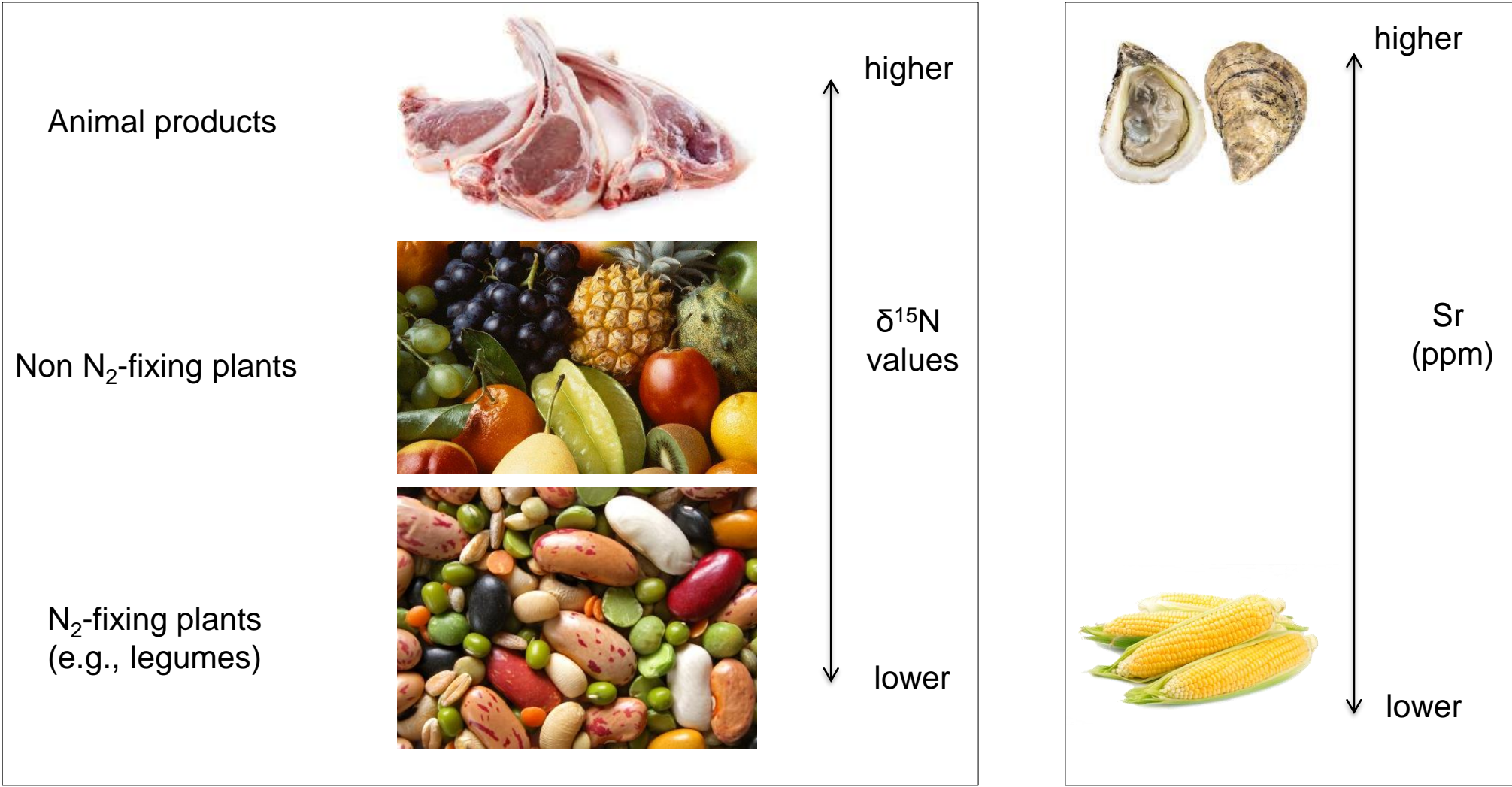
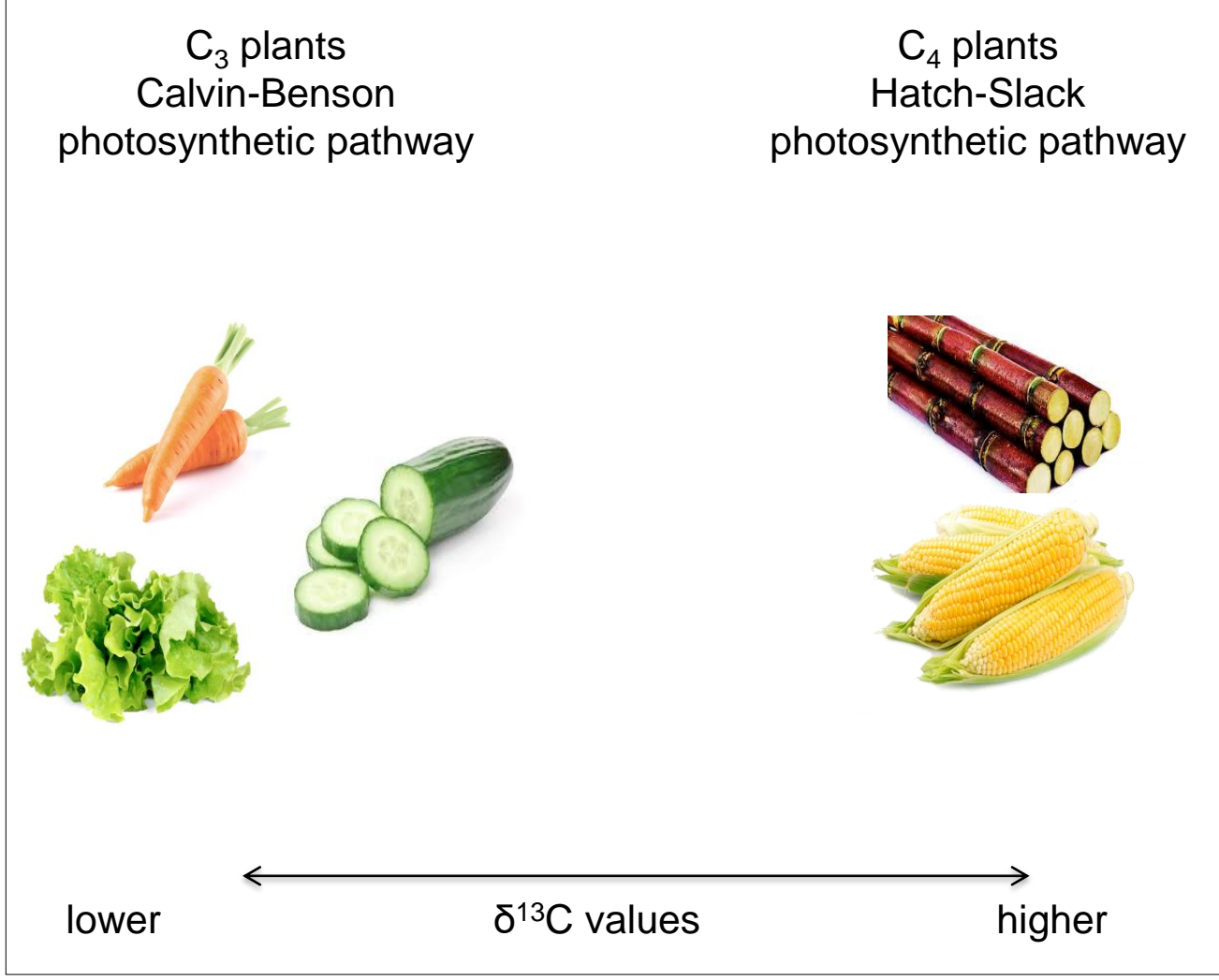


ICW's enamel $^{87}\text{Sr}/^{86}\text{Sr}$ values are higher than the proposed local NYC $^{87}\text{Sr}/^{86}\text{Sr}$ range (0.710-0.712) estimated from individuals interred in the colonial period New York City African Burial Ground in lower Manhattan (Goodman et al., 2004). As expected, the $^{87}\text{Sr}/^{86}\text{Sr}$ values measured from African slaves of the Newton Plantation in Barbados by Bastos et al. (2016) are significantly lower than those of ICW. ICW's enamel $^{87}\text{Sr}/^{86}\text{Sr}$ values are not significantly different from those measured on individuals from the Free Black Community of Newburgh, NY (Nystrom et al., 2011) located in the Hudson Valley, which is the source region for much of the glacial till of Queens.

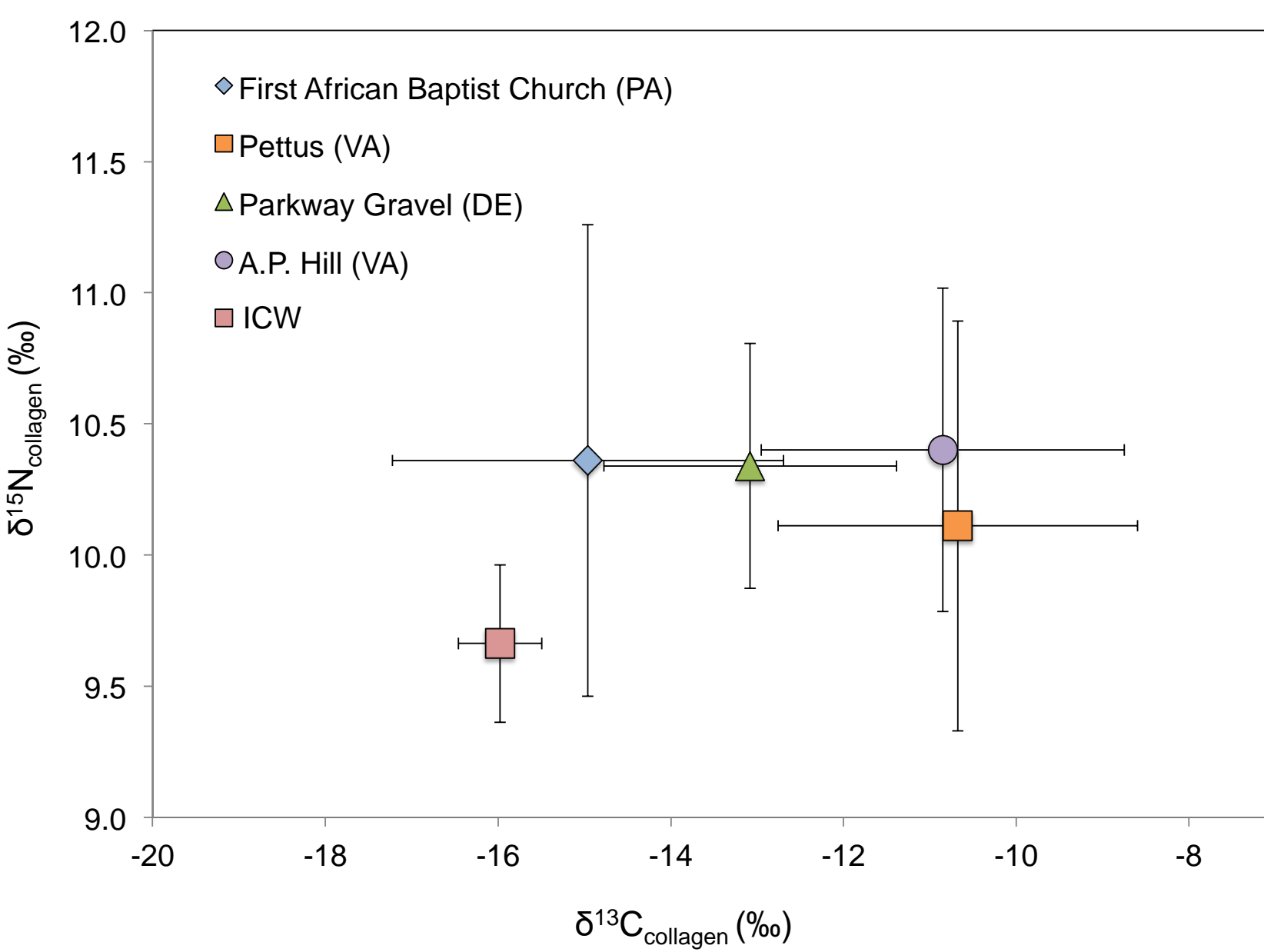
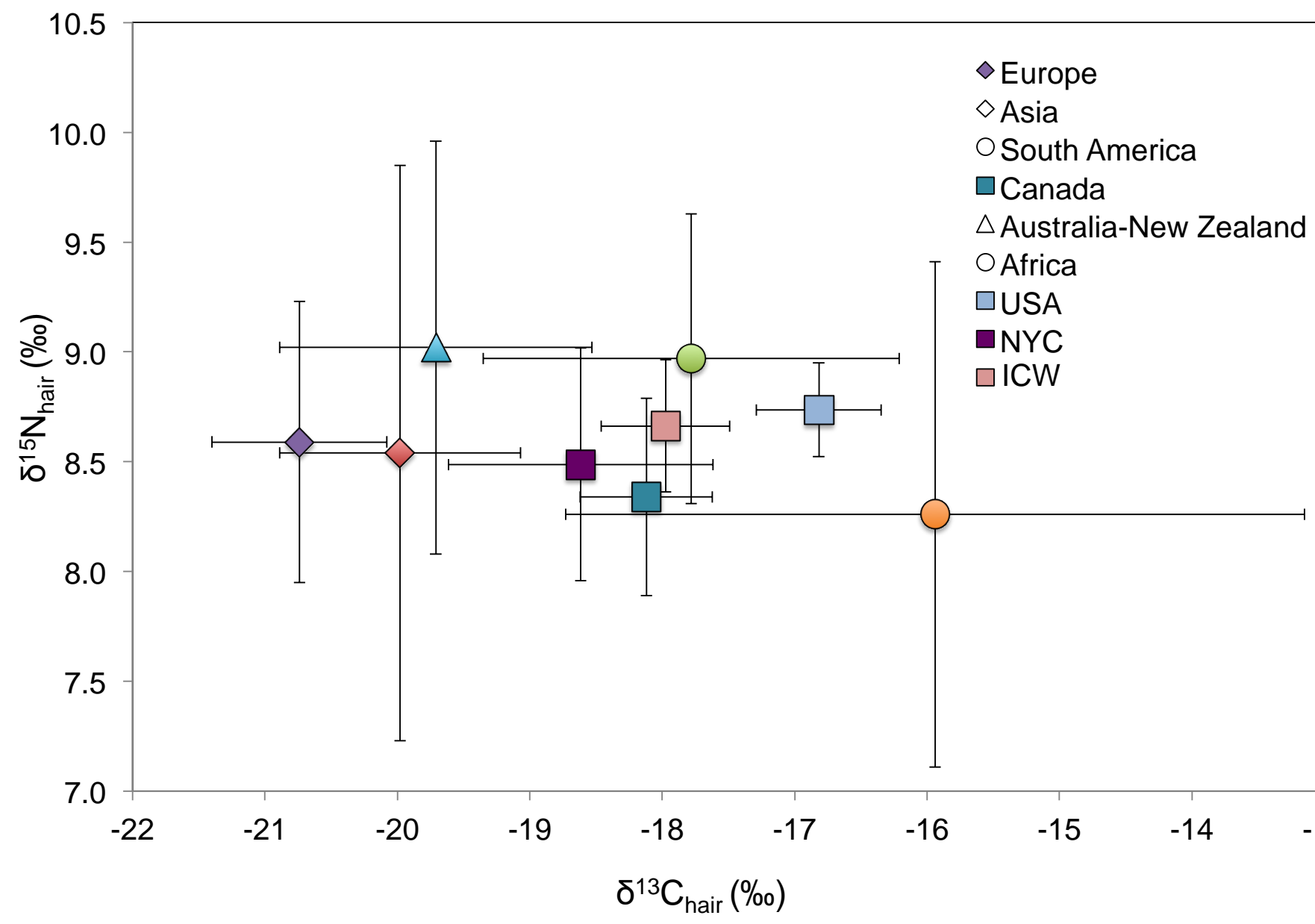


ICW's elevated lead concentrations suggest living in proximity to lead production centers during middle childhood; NYC was one of those centers during the 19th century (Keller et al., 2016). The overlapping $^{87}\text{Sr}/^{86}\text{Sr}$ ranges of the NYC region and West Africa complicates the clear separation of individuals of African geographic origins and individuals of African ancestry with origins in proximity to NYC during the time periods of slavery and forced migration to the US. One possible means of differentiating African-born individuals from those originating from the NYC region is the measurement of Pb concentrations. We suggest the combination of $^{87}\text{Sr}/^{86}\text{Sr}$ and Pb concentration data from the same enamel sample distinguishes West African origins from one in the NYC region during the mid-19th century.

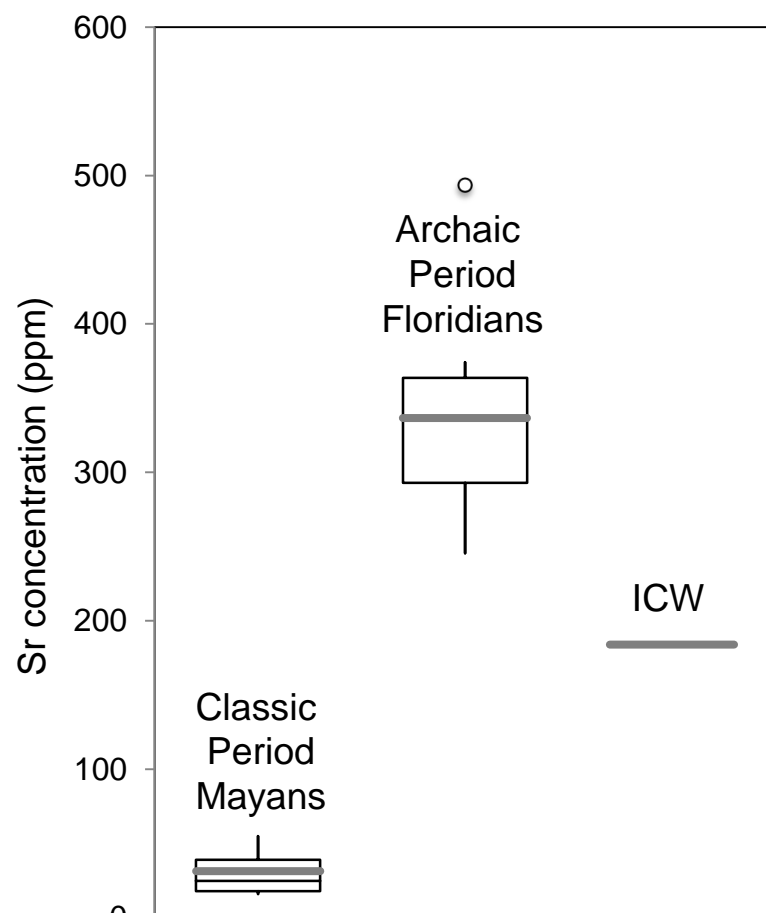
Measures of Diet and Health



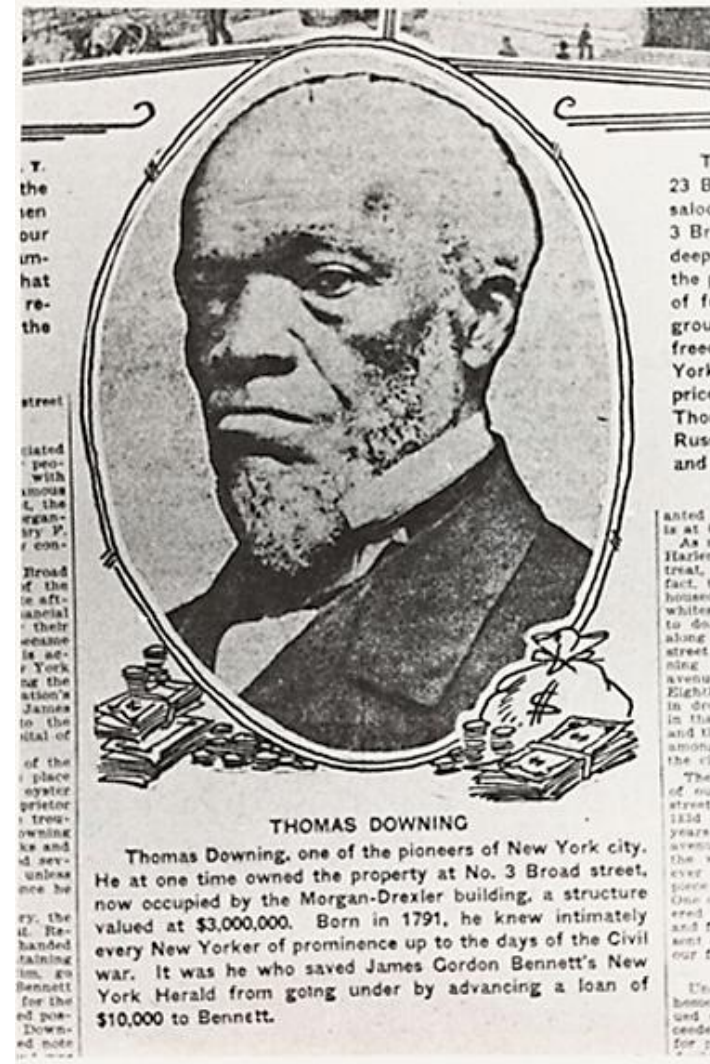
We interpret that ICW subsisted on a diet of C_3 vegetation (e.g., lettuce, apples, beans, carrots) and C_3 -based protein, which likely included a component of terrestrial herbivore protein (e.g., beef, chicken, lamb). $\delta^{15}\text{N}$ values are not elevated compared to other contemporary or modern samples and therefore there is no isotopic evidence that she suffered from a protein deficiency (e.g., Reitsem, 2013). ICW shows a diet composed of less corn-based foodstuffs than other African Americans from more southerly regions (Delaware and Virginia) and similar to those living in adjacent areas (Pennsylvania). ICW's protein consumption was lower than other African and African descent individuals reported in France et al. (2014), but does not likely represent vegetarian or vegan dietary practices per se. ICW's relatively low $\delta^{15}\text{N}$ values may also be the result of consuming legumes. Black-eyed peas, which are nitrogen-fixing legumes, were (and are) staples in African-American culinary traditions (Harris, 2011).



Element	Concentration (ppm) $\pm 1\sigma$
⁷⁵ As	Below detection
⁸⁸ Sr	183.8 \pm 2.2
²⁰⁶ Pb	29.9 \pm 30.3
²⁰⁷ Pb	27.3 \pm 27.3
²⁰⁸ Pb	27.9 \pm 27.8
²³⁸ U	Below detection



ICW's Sr levels may indicate access to shellfish as well as high Ca vegetables. NY Harbor was home to one of the largest oyster industries in the 19th C., Numerous NYC oyster houses were owned by African-Americans. Thomas Downing was one of the most successful.



ICW's high lead concentrations suggest health issues during middle childhood, which were common in African Americans living in 19th century NYC suffering from poor living conditions and gaining little access to professional doctors (Harris, 2003). After methods in Schroeder et al. (2013), ICW's blood lead level would be estimated at 270 Mg/dl and would have resulted in severe health complications including severe colic, spasms, paralysis, and potentially coma. Given that ICW lived into early adulthood (25-35 years), it is implied that she maintained access to resources in order to live with, rather than succumb to, the lead-caused health complications.