The Role of the New Mexico Decedent Image Database in Research at Boston University's Program in Forensic Anthropology

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Established in 2009, the M.S. Program in Forensic Anthropology in the Department of Anatomy & Neurobiology at the Boston University Chobanian & Avedisian School of Medicine has graduated more than 140 students who have gone on to careers and/or continued education in anthropology, the forensic sciences, academia, research, law, and medicine. In 2018, Sean Tallman established the **Forensic and Bioanthropology Laboratory (FAB Lab) Group**, comprised of graduate students and advanced undergraduates whose research focuses on human skeletal variation, forensic anthropology methods and praxis, human identification, bioarchaeology, and diversity, equity, and inclusion. Of the 55 former and present FAB Lab students, 33% (n=18) used or are using data from the New Mexico Decedent Image Database (NMDID) (former = 11/43, 26%; present = 7/12, 58%). **This research has challenged essentialized assumptions about human skeletal variation and includes skeletal sex (and gender), age-at-death, ancestry/population affinity, structural vulnerability/weathering, commingling, pathology, and human variation (see pie chart).** While the NMDID represents the most forensically relevant sample available and will continue to contribute to theses, some issues include ethics (not self-donated), inconsistent metadata, and scan resolution. Learn more about the FAB Lab and follow on Bluesky @fablabbu.bsky.social!

Jessie Flynn is currently using the NMDID to examine how asymmetry and fragmentation impact pair-matching of long bones in commingled assemblages with mesh-to-mesh value comparisons. **Faith Flanders** is presently using the NMDID and data from the Boston University Medical Center to see if HIV/AIDS and treatments are associated with pathological changes in the skeleton. **Madison Butler** is using the NMDID to research how the glabella, often used in skeletal sex estimation, is affected by frontal sinus size/shape and cranial length.

Jandi Palmer (2024) examined evidence for the "weathering hypothesis" via antemortem tooth loss (AMTL), untreated oral disease (e.g., abscesses, caries, resorption), and restorations in 296 African and European American individuals divided into four age cohorts from the NMDID. While the results were somewhat mixed for AMTL and restorations, the African American sample showed higher rates of oral disease in all age cohorts, particularly in those 18-29 and 50-69 years (Figure 1). While the study was unable to control for socioeconomic status, chronic health conditions, smoking, and diet, the results suggest that the embodied stresses associated with marginalization prematurely weather the dentition.

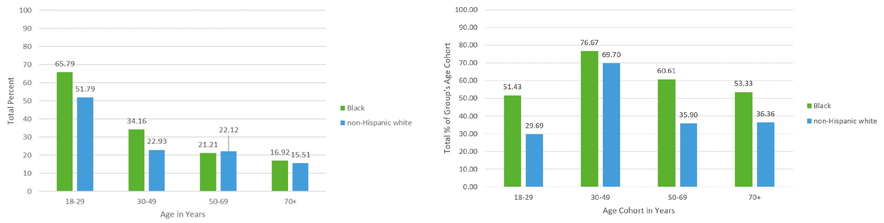


Figure 1. Bar charts showing AMTL (left) and oral disease (right) frequencies by bureaucratic race categories (Palmer 2024:61,69).

Related to weathering, **Elizabeth Poplavska** (2025) examined oral health in 242 individuals 18-50 years old with a history of opioid use (n=134) and those without (n=108) in the NMDID through a structural vulnerability lens by incorporating sociodemographic variables (e.g., socioeconomic status, tobacco use, alcohol use, and education level). She found that opioid use is somewhat associated with AMTL and strongly associated with everyday tobacco use (Figure 2). This supports previous research showing that daily smoking is a risk factor for opioid addiction and that within structurally vulnerable groups, systemic oppression can result in psychobiological impacts that make marginalized individuals more susceptible to relying on substances.

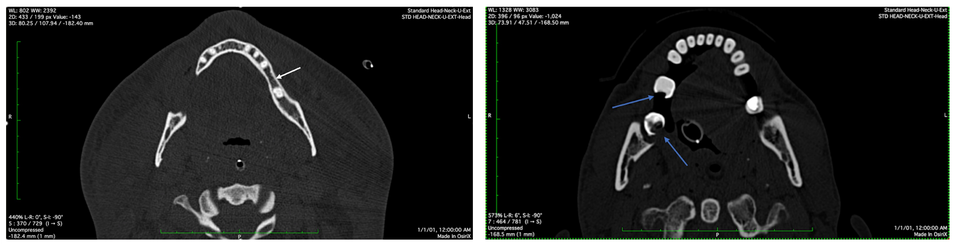
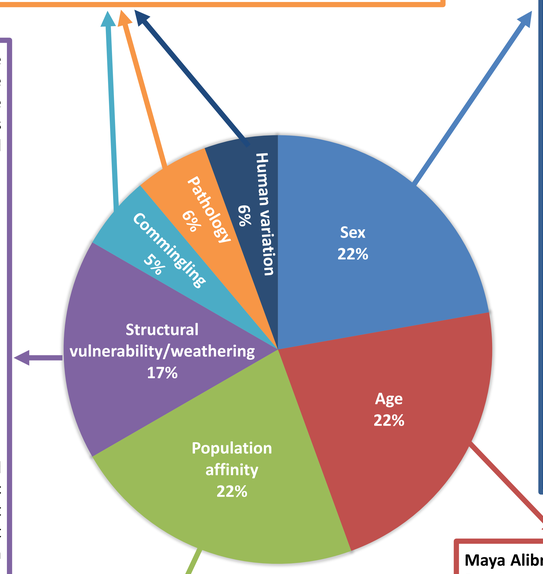


Figure 2. CT scans showing AMTL, dental caries, and restorations (Poplavska 2024:71,72).



Bibliography

Mandi Beauvais (2023) examined secular change in nonmetric cranial traits frequently used in forensic ancestry estimation in 150 pre-contact Indigenous individuals from the American Southwest and 100 modern Indigenous individuals from the NMDID. She found that 22 of the 24 traits changed significantly over time and that modern classification approaches using "hefnerR" correctly classified only 14% of pre-contact and 11% of modern Indigenous individuals. She concluded that pre-contact Indigenous individuals should not be used as proxies for modern individuals and that nonmetric forensic ancestry approaches fail to capture the immense range of Indigenous variation.

The lackluster performance of traditional forensic ancestry estimations was further demonstrated by **Giulia Dunn** (2025), who tested the accuracy of Fordisc 3.1 on 148 demographically diverse individuals from the NMDID using standard cranial measurements. Only 36% of the sample was "correctly" classified: 13% of Asian Americans; 13% of Native Americans; 41% of Latin Americans; 42% of European Americans; and 69% of African Americans. As such, Fordisc's problematic and antiquated samples complicate and potentially prevent their application to modern individuals from the U.S.

A less frequently used ancestry estimation method by Pilloud et al. (2014) involving mesial-distal (MD) and buccal-lingual (BL) tooth crown measurements was tested by **Mae Gibson** (2025) on 89 demographically diverse individuals from the NMDID. Only 37% of the sample was "correctly" classified, including 47% of African Americans, 85% of Asian Americans, and 0% of European Americans (all European Americans were classified as Asian American). While statistically significant differences were found between some groups for MD measurements, no differences were found in BL measurements. A cross-validated discriminant function correctly classified only 21% of the sample. Therefore, odontometric ancestry estimation approaches are not suggested for modern U.S. individuals, which is further complicated by tooth loss, inequities in dental care, and measurement difficulties on CT scans.

Katrina Faulkner is researching proximal femur size and shape variation in Indigenous individuals from the NMDID, pre-contact Indigenous individuals, and modern African/European American individuals. Check out her poster in this symposium!

Samantha Kelley explored population-inclusive nonmetric, metric, and combined methods for estimating assigned sex at birth using skull CT scans from the NMDID largely in response to increasing concerns about ancestry/population-specific approaches that essentialize groups and reinforce the biological race concept (Kelley & Tallman 2022). Using a demographically diverse sample of 3D volume-rendered CT scans (n=431; Figure 3), population-inclusive accuracies ranged 81.0-91.6%, which did not significantly differ from population-specific accuracies. This research demonstrated that population-inclusive methods, which potentially incorporate more variation than population-specific methods, can be used when ancestry is truly unknown or removed entirely from the biological profile.

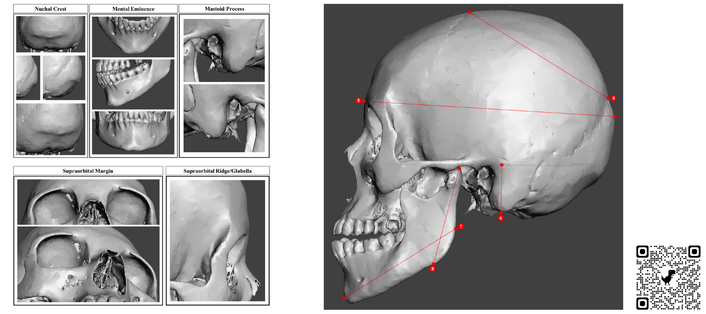


Figure 3. Examples of nonmetric and metric variables collected on 3D volume-rendered scans from Kelley & Tallman (2022:328,330). Learn more about this research!

Victoria Conquest (2025) tested Kelley & Tallman's (2022) models on 439 skeletonized individuals from the University of Tennessee, Knoxville's Donated Skeletal Collection. She found that the models developed on CT scans can be applied to dry-bone individuals from a more demographically homogenous collection with accuracies of 79.3-85.6%. **Haleigh Villalba** is presently testing Kelley & Tallman's (2022) population-inclusive models on 500 additional demographically diverse decedents from the NMDID. Relatedly, **Kaitlyn Bowling** is presently developing population-inclusive skeletal sex estimation models for the pubic bone traits from the NMDID while using Kelley & Tallman's (2022) study as a model.

Alysa Ehlers (2025) examined how accurately commonly used forensic anthropological assigned sex estimation methods perform when applied to potential intersex and transgender decedents in the NMDID (n=20), who were identified as such through the accompanying metadata. She found that only three of 15 metric methods correctly identified the decedents' assigned sex at birth. Additionally, the terminology used in the NMDID metadata to classify and describe intersex and gender-diverse decedents was analyzed, and half the terms were found to be derogatory/outdated (n=16) and neutral (n=15), revealing systemic issues in forensic data practices.

Maya Alibrio investigated whether cancer and cancer treatment influence the accuracy of skeletal age estimation using the Suchey-Brooks method in 307 individuals with (n=182) and without (n=125) documented cancer from the NMDID (Alibrio & Tallman 2024). While not statistically significant, lower accuracies were found in individuals with cancer (females = 74.7% vs. 85.1%; males = 46.0% vs. 55.7%). These findings suggest that cancer and treatment may not significantly affect the pubic symphysis, though CT imaging may not capture subtle bone-quality changes related to bone mineral density loss (Figure 4).

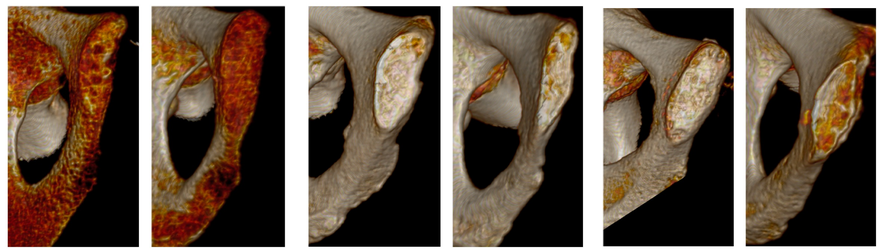


Figure 4. Examples of 3D volume-rendered pubic symphyses (Alibrio & Tallman 2024:9-10). Learn more about this research!

Honorary FAB Lab member, **Maya Joshi**—a high school student at the time of the research (!)—investigated the use of 3D convolutional neural networks for age estimation in 1,224 individuals from the NMDID (Joshi & Tallman 2023). Training sets were developed on 856 individuals and tested on 369 individuals in nine age cohorts 0-89 years of age (Figure 5). The best model accurately predicted age in 63% of individuals +/-15.3 years, which demonstrates potential for using black-box methods for age estimation from CT scans.

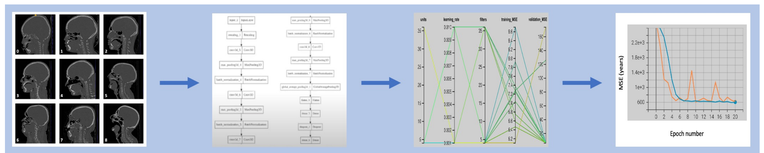


Figure 5. Research process and graphical abstract from Joshi & Tallman (2023). Learn more about this research!