

limited analysis (due to damage) of StW 352 and the Omo calcaneus found that StW 352 is within the range of modern humans while the Omo calcaneus clusters near gorillas. The unusual position of the Omo calcaneus raises questions about its attribution to *Homo*. The clustering of the Hadar calcanei with modern humans supports previous interpretations of *A. afarensis* as possessing a surprisingly human-like calcaneus at ~3 Ma. Lastly, taken together the GM analysis of the calcaneus shows that *A. sediba* occupies a unique morphospace compared to the extant great apes and other Plio-Pleistocene hominins, possibly reflective of this species increased reliance on arboreality.

### Reevaluating the Relationship between Anemia and Cranial Porosities in a 13<sup>th</sup> Century Ancestral Puebloan Population

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Anemia, a physiological condition resulting from an inadequate or ineffective supply of erythrocytes, is a major global health problem affecting approximately 27% of the world's population and 43% of all children under 5 years of age. Traditionally, bioarchaeologists have assessed general population health by evaluating the prevalence and severity of two biomarkers thought to result from cranial bone marrow (CBM) expansion secondary to anemia: cribra orbitalia (CO) and porotic hyperostosis (PH). The etiologies of these biomarkers remain poorly understood, and current scoring standards produce high rates of interobserver error. The goal of this study is to develop an interpretive framework for evaluating CO and PH which: 1) integrates recent clinical studies on CBM development throughout the lifespan, and 2) better accounts for locally-specific dietary and environmental factors which influence anemic etiologies. As a test case, the presence and severity of CO and PH were assessed using the Global History of Health Project standards for 263 individuals from Turkey Creek Pueblo, a 13<sup>th</sup> century Ancestral Puebloan settlement. Sex and age were assessed using standards developed by Buikstra and Ubelaker (1994). Low overall rates of CO and PH (13.5%/39.9%) indicate the population enjoyed good general health. Varied rates and severity scores of CO and PH across age cohorts suggest that changes in cranial bone marrow (CBM) throughout the lifespan impact the development of cranial porosities. Accordingly, it is recommended that scoring standards should be revised to account for age-related changes to CBM content and diploë volume.

### Regional variations in predominant collagen fiber orientation in the diaphysis and neck of sub-adult baboon femora resemble those in adult chimpanzee femora. Does this reflect similar load histories?

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Studies of how microstructural/nanostructural and gross structural characteristics might functionally adapt a bone have shown that predominant collagen fiber orientation (CFO) is the strongest correlate of a bone's load history, regardless of whether it is habitual torsion or bending. But these data were obtained mostly in adult bones. To better establish the use of CFO data for interpreting strain history, we studied femora from sub-adult baboons (*Papio cynocephalus anubis*; ages 3-4 years, n=5). Sections were cut transversely at mid-diaphysis (presumably mostly a torsion region), upper diaphysis (presumably bending>torsion), and femoral neck (presumably bending>torsion). Circularly polarized images obtained in octants were examined for predominant CFO, which was inferred from mean gray levels (birefringence differences) where: (1) brighter gray levels represent oblique-to-transverse CFO, which adapts bone for compression, and (2) darker gray levels represent more longitudinal CFO, which adapts for tension. Baboon CFO data were compared to our reported results in adult chimpanzee femora. Results showed that the baboon femora had approximately the same regional differences shown previously in adult chimpanzees. Specifically, the baboon femoral neck had more oblique-to-transverse CFO in the posterior-superior, superior, anterior-superior, and anterior cortices when compared to combined data of the other four cortices (p=0.001). Similar to chimpanzees, the baboon femora also had: (1) expected CFO differences between medial (compression) and lateral (tension) cortices for habitual bending across the upper diaphysis, and (2) the mid-diaphysis showed no regional CFO differences, as expected in habitual torsion. These results suggest that regional CFO variations can be useful for interpreting load history in sub-adult bones.

### Differences in Obstetric Care Experiences Across Demographic Groups in Alabama

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According to the Centers for Disease Control, Alabama had the United States' worst infant mortality rate (IMR) in 2014. In 2015, the IMR for white residents was 5.2%, but among black and other residents it was 14.4% in Alabama. The goal of this project is to provide geographical data and case studies to better understand the

implications of Alabama's IMR and to address factors in the overall gap in treatment between demographic groups. This project includes geographical analyses using rates of infant mortality by county, location of hospitals with and without obstetric centers, distribution of midwifery services, rural and low income communities across Alabama, and demographics including race. Data suggest the IMR tends to be highest in rural counties, and especially those with fewer hospitals in the region. Additionally, those counties with more demographic minorities tend to have a higher IMR than those that do not, and tend to be farther from hospitals with obstetric centers. Case studies of birth experiences from low-income minority women in rural areas were compared to case studies of higher income women from urban and suburban areas. Obstetric care experience satisfaction for rural-dwelling low-income minority women was lower than urban- and suburban-dwelling high-income women. These narratives, when combined with geographical analyses, elucidate treatment gaps in underserved populations that inform where improvement can be made in Alabama's obstetric care.

### Weed Macaques provide insight into the demographic success of early hominids

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Hominids (*Australopithecus* and *Homo*) and *Macaca* have proved unusually successful demographically in the Plio-Pleistocene. Current evidence suggests that these two clades greatly expanded their geographic ranges beginning around 3.5 MYA (hominids) and 7 MYA (macaques). Today macaques enjoy broad taxonomic success as well, with some 20 living species that resulted from three major radiations. A detailed examination of their vital rates is therefore instructive.

Richard et al. (1989, *Inter. J. Primatology*, 10(6):569-594) have designated four macaques as "weed species," owing to their preference for riverine secondary forests that emerged across tropical Asia during thousands of years of human disturbances including swidden agriculture. Secondary forests were likely primary niches for *Australopithecus* as well, and we separate the mortality and fertility functions of the weed species to show that they can serve as models for Pliocene radiations.

Female macaque fertility is more resistant to the environment than many have come to believe. The success of these monkeys is instead due to a lessening of pre-reproductive mortality, which propels a larger proportion of the female birth cohort into the reproductive years, resulting in episodes of extremely high population growth.