Not just genes: Environment also shaped population variation in first Americans

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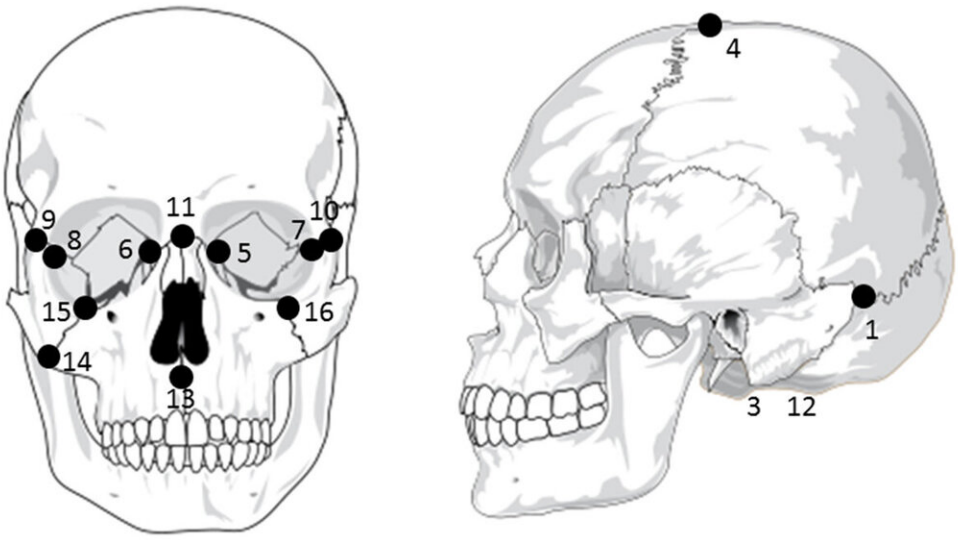

Common craniofacial landmarks. Credit: North Carolina State University

The first Americans—humans who crossed onto the North American continent and then dispersed throughout Central and South America—all share common ancestry. But as they settled different areas, the populations diverged and became distinct. A new study from North Carolina State University shows that facial differences resulting from this divergence were due to the complex interaction of environment and

evolution on these populations and sheds light on how human diversification occurred after settlement of the New World.

"If we want to understand variation in modern populations in Central and South America specifically, then we need to examine variation in prehistoric American populations during the formative period after they settled the continent but prior to European contact," says Ann Ross, professor of biological sciences at NC State and lead author of a paper describing the work.

In the first craniofacial variation study to look at the continent as a whole—a study 20 years in the making—Ross and co-author Douglas Ubelaker of the Smithsonian Institution examined skulls from across Mesoamerica and Central and South America. The skulls dated from 730—1630 A.D., and came from environments ranging from arid to alpine to coastal. Using a 3-D digitizer, the researchers recorded standard anatomical landmarks on the skulls in order to get a consensus configuration for each population group. They compared the group configurations to determine the types of variation associated with each group.

"There's a lot of debate as to what models modern cranial variation," Ross says. "Mutations would insert the most variation, but they're very rare. Adaptation to environment is another possibility, but many researchers believe variation is largely due to a neutral process such as genetic drift, which occurs when populations separate and stop exchanging genes."

Ross and Ubelaker found that highland populations from across the region were similar to each other, as were lowland populations. But comparing highland with lowland populations showed higher variation between the two groups.

"That makes sense," Ross says. "You probably wouldn't travel from the mountains to the beach in order to find a mate. And we know that these groups were exchanging more than just pots."

While those results could be attributed in part to genetic drift, the researchers also found that other factors—such as adaptations to climate and altitude—also played a role in craniofacial differentiation between populations. Ross hopes that the work can serve as a baseline for future studies.

"Population divergence is a multifactorial process, a complex interplay of factors," Ross says. "If you want to find out why these populations diverge you have to look at multiple factors, not just genetics or DNA."

The work appears in *Scientific Reports*.

More information: Ann H. Ross et al, Complex Nature of Hominin Dispersals: Ecogeographical and Climatic Evidence for Pre-Contact Craniofacial Variation, *Scientific Reports* (2019). DOI: 10.1038/s41598-019-48205-1

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