

A37 Fluctuating Asymmetry: A Craniofacial Comparison to Better Understand Central American and Mexican Migration

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Learning Overview: After attending this presentation, attendees will better understand the biological consequences of socioeconomic stress on the human skeleton.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by highlighting the utility of fluctuating asymmetry as a measure of environmental stress associated with socioeconomic disparities.

Decades of United States policy, intervention, and local political corruption have contributed to the deteriorating socioeconomic conditions in Latin America, which have led to mass exoduses of Central Americans and Mexicans seeking refuge in the United States. In particular, the escalation of violence in the “Northern Triangle” countries of El Salvador, Guatemala, and Honduras has given people no choice but to flee to the United States despite the risk of violence and death along the journey. Since the implementation of United States border enforcement policies beginning in the 1990s, migrants seeking refuge in the United States have been further confronted with barriers that limit their movement, resulting in thousands of migrant deaths along the United States-Mexico border.

Deteriorating socioeconomic conditions in migrant home countries have created environmental stressors that affect physical development. The inability for humans to buffer environmental stress during the critical period of physical development can result in skeletal manifestations of stress, including Fluctuating Asymmetry (FA)—deviations from perfect bilateral symmetry. Previous research has shown associations between environmental stress and Socioeconomic Status (SES)—the attainment of income, occupation, and education. With SES as the focus, the present study used craniofacial FA as a measure of environmental stress in Central American and Mexican migrants. Through craniofacial FA, the present study explored the relationship between environmental stress and push factors for United States migration.

Using a Microscribe® 3DX digitizer, 22 craniofacial landmarks were collected from 678 individuals from three skeletal samples: Operation Identification (OpID) (M = 107, F = 59), the Pima County Office of the Medical Examiner (PCOME) (M = 247, F = 36), and the University of Tennessee William M. Bass Donated Skeletal Collection (BDC) (M = 166, F = 63). The skeletal samples were classified as Central American, Mexican, and United States resident, respectively. The BDC sample was used as a base measure of SES, as these individuals were assumed to be of higher SES, experiencing less environmental stress due to their access of resources in the United States.

Craniofacial landmarks were entered into MorphoJ to generate Mahalanobis FA scores, which were then compared using a Two-way and One-way Analysis of Variance (ANOVA). Developmental timeline graphs were created for identified OpID Mexican (8), El Salvadorian (10), Guatemalan (11), and Honduran (3) individuals, overlaid with timelines of major events (i.e., North America Free Trade Agreement [NAFTA] of 1994, Mexico’s 1980s financial crisis, Illegal Immigration Reform and Immigrant Responsibility of 1996 Act, El Salvadorian Civil War 1980–1992, and Guatemalan Civil War 1960–1996), which have shown to have had major socioeconomic impacts in Central America and Mexico. The temporal relationships between developmental timelines and major events were useful in assessing the relationship between environmental stress and levels of FA. FA statistical analysis and temporal relationships were further examined to assess the relationship between environmental stress and push factors for United States migration.

FA statistical analysis showed that Mexican migrants had higher levels of FA (M = 5.03) compared to Central American migrants (M = 4.75, $p = .014$) and the United States resident group (M = 4.74, $p = .005$), who had similar levels of FA. The results suggest that Mexican migrants may be of lower SES, experiencing more environmental stress during physical development. Mexican developmental timelines demonstrated six temporal relationships with either the 1980s financial crisis, NAFTA, or both. Statistical analysis and temporal relationships suggest that the socioeconomic costs of both events may have contributed to the higher levels of FA in the Mexican migrant sample. Overall, Central American developmental timelines demonstrated temporal relationships with either civil war, immigration reform, or both. Considering the results from FA statistical analysis, temporal relationships, and previous research, the lower levels of FA in the Central American migrant sample may reflect how violence affects the overall population, driving individuals from all SES’s to flee from the “Northern Triangle.”

The present study demonstrates a relationship between environmental stress and historic Mexican economic migration push factors. The results further show that violence continues to act as a decisive and forceful factor for Central American United States-bound migration.

Fluctuating Asymmetry, Environmental Stress, Migration