

REGIONAL CONNECTIVITY AMONG AVAR PERIOD POPULATIONS - A NETWORK ANALYSIS USING CRANIOMETRIC TRAITS

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Background: Network-based approaches allow population-level biological-distance data to be examined beyond conventional pairwise comparison, capturing how individual sites are embedded within a broader web of relationships. Applied to the Avar period Carpathian Basin, such approaches can reveal whether geographic regions differ systematically in how strongly and how broadly their constituent sites are connected within the wider network.

Objective: To construct a pruned craniometric biological-distance network of Avar period sites in the Carpathian Basin, and to evaluate whether geographically defined regions correspond to distinct connectivity profiles, independently identified community structure, and node-level structural roles.

Subjects and methods: Twelve craniometric variables were recorded for 1,716 individuals from 49 Avar period sites in the Carpathian Basin, grouped into four larger geographic regions (Transdanubia, Danube Tisza Interfluve North and South, Transisza). A population-level biological-distance matrix was computed and pruned into a network. Node-level metrics were calculated for each site. Regional differences in these metrics were assessed via Kruskal-Wallis tests. Node-level structural roles were additionally classified using data-driven percentile thresholds and compared against regional membership using the Adjusted Rand Index.

Results: Regions differed significantly in several network metrics, revealing distinct connectivity profiles, although substantial within-region variability was also observed, indicating that regional membership alone does not fully determine the network position of a site. Community structure identified showed only weak-to-moderate correspondence with geographic regions, suggesting that regional boundaries only partially capture the underlying pattern of biological similarity.

Conclusion: The results indicate that regional averages alone do not adequately capture individual site behaviour, supporting the value of pursuing finer-scale, sub-regional analyses in future work. Geographic regions alone do not fully account for population structure and connectivity patterns in this network, plausibly reflecting mobility or shared earlier population history.

Keywords: Biological distance; Network analysis; Avar Period.

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