

Geographic Legacies for Modern Day Disease Research: Autism Spectrum Disorder as a Case-Control Study

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Abstract : Elucidating gene-environment interactions for heritable disease outcomes is an emerging area of disease research, with genetic studies informing hypotheses for environment and gene interactions underlying some of the most confounding diseases of our time, like autism spectrum disorder (ASD). Geography has thus far played a key role in identifying environmental factors contributing to disease, but its use can be broadened to include genetic and environmental factors that have a synergistic effect on disease. Through the use of family pedigrees and disease outcomes with life-course residential histories, space-time clustering of generations at critical developmental windows can provide further understanding of (1) environmental factors that contribute to disease patterns in families, (2) susceptible critical windows of development most impacted by environment, (3) and that are most likely to lead to an ASD diagnosis. This paper introduces a retrospective case-control study that utilizes pedigree data, health data, and residential life-course location points to find space-time clustering of ancestors with a grandchild/child with a clinical diagnosis of ASD. Finding space-time clusters of ancestors at critical developmental windows serves as a proxy for shared environmental exposures. The authors refer to geographic life-course exposures as geographic legacies. Identifying space-time clusters of ancestors creates a bridge for researching exposures of past generations that may impact modern-day progeny health. Results from the space-time cluster analysis show multiple clusters for the maternal and paternal pedigrees. The paternal grandparent pedigree resulted in the most space-time clustering for birth and childhood developmental windows. No statistically significant clustering was found for adolescent years. These results will be further studied to identify the specific share of space-time environmental exposures. In conclusion, this study has found significant space-time clusters of parents, and grandparents for both maternal and paternal lineage. These results will be used to identify what environmental exposures have been shared with family members at critical developmental windows of time, and additional analysis will be applied.

Keywords : family pedigree, environmental exposure, geographic legacy, medical geography, transgenerational inheritance

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