AN INTEGRATED APPROACH TO ENVIRONMENTAL ROAD EXPOSURE AND ITS IMPLICATIONS FOR COGNITIVE HEALTH OUTCOMES

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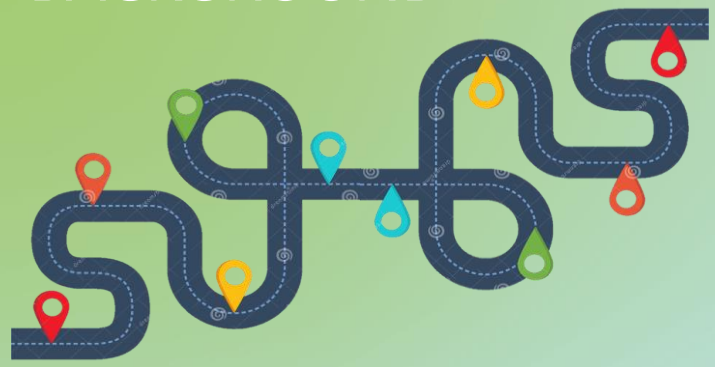
BACKGROUND



Road networks in many countries have become either the primary or one of the most prevalent sources of environmental pollution. This pollution is multi-faceted, as air pollution from car exhausts, soil pollutants (often derived from air pollutants), and physical pollution, such as light from streetlights, and noise from vehicular congestion combine to effect human health. Over wide areas these effects can combine and have synergistic outcomes. The primary aim of this research is to take an integrated approach to understanding how the synergistic impacts of the road network can lead to negative health effects in the NICOLA cohort.

Previous research has investigated these factors, but synergistic approaches, taking multiple pollutants into account have remained challenging.

METHODOLOGICAL APPROACH

GIS tools have been used to prepare and visualise the data. Four buffers: 300m, 500m, 1000m, and 2000m (Fig. 1), around A and M roads in the NI road network, have been used as categorical variables. To select groups of the NICOLA cohort living within these different zones. From there, environmental pollution data within 1200m circular buffers around an individual's home address location, has been used to show the average potentially toxic element values for a selected shortlist of soil elements: As, Cd, Co, Hg, Mo, Pb, Rb, Sb, Se, Sn, Th, U, Al, Ba, Cr, Cu, Fe, Mn, Ni, Sr, V, Zn. PM2.5 and physical pollution data like light and noise may also be included.

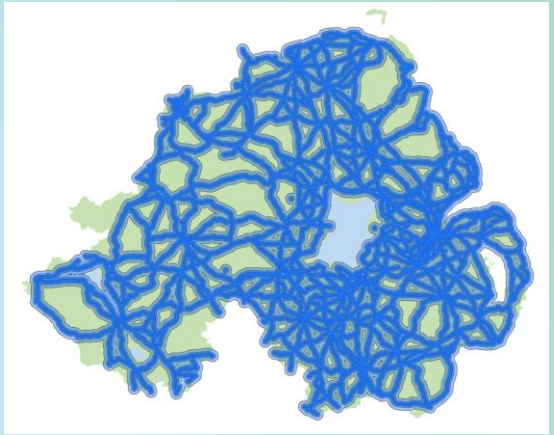


Fig. 1 Road buffers 300m 500m, 1000m, and 2000m around the major road network of NI Prepared in Arc GIS Pro.

R software will be used to model and analyse data. Primarily, a compositional approach will be taken. Looking at data as parts summing to a whole. Further, dimension reduction approaches will be used to understand the synergistic relationships between environmental variables (PCA/ cluster analysis (Fig. 2)/ modelling approaches/ factor analysis/ discriminant analysis/ canonical analysis, etc.) and cognitive health outcomes in the NICOLA cohort: MMSE and MOCA scores.

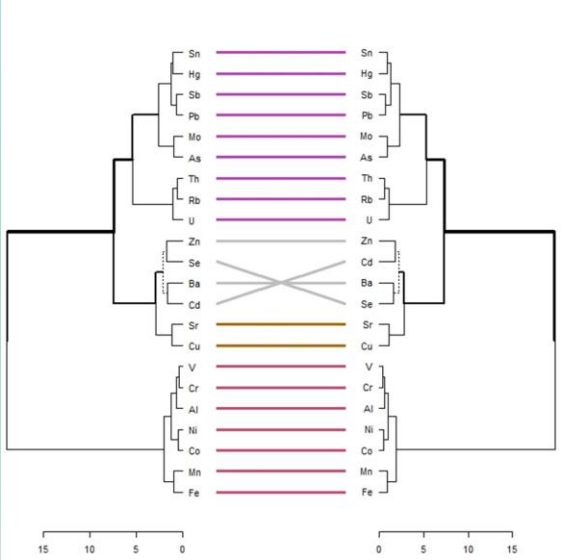


Fig. 2 Cluster plot comparison 300m and 2000m road buffer centre log-ratio (clr) transformed shortlisted potentially toxic element data.

CONCLUSIONS

This approach will seek to elucidate what effect the road network is having on cognitive health by assessing environmental pollutants against cognitive scores. and attempt to identify strategies to mitigate against in future. Consequently, seeking to inform future health and public health policy initiatives.

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