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Spatial distribution of healthy and unhealthy food groups in rural and urban food environments: A case study for Kenya

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Abstract

The growing burden of nutrition-related non-communicable diseases (NCDs) in low and middle-income countries is linked to evolving built food environments that increasingly favour unhealthy food availability. This study uses spatial autocorrelation analysis to reveal concentration areas of healthy or unhealthy food groups in rural and urban food environments in Kenya.

Research was conducted in two distinct locations: Viwandani ward, an informal settlement in Nairobi County representing a low-income urban food environment, and Kiima Kiu ward in Makueni County, representing a rural food environment. GPS coordinates were collected from all vendors in these areas, who were categorised into 14 types, with their food offerings recorded. Foods were categorised based on the Global Dietary Recommendation score as either healthy food group (fruits, vegetables, legumes, whole grain) or unhealthy food group (food high in salt, sugar and fat). Multi-Distance spatial cluster analysis was used to establish distribution of vendors, while Global Morans' I was used to establish the distribution of healthy or unhealthy food groups in the respective food environments.

Spatial autocorrelation analysis revealed higher clustering of vendors in the rural food environment compared to the urban setting, though rural vendors clustered at longer distances. Moran's I spatial analysis showed significant clustering of vendors selling unhealthy food groups in both environments. Significant clustering of vendors selling healthy food groups occurred only in the rural food environment. Poisson regression model analysis of vendor categories' contributions to healthy food group availability showed that tabletop vendors had a significantly higher association with healthy food group availability (IRR = 1.19, $p < 0.001$). Supermarkets showed a significantly weaker association with healthy food group availability (IRR = 0.62, $p < 0.012$) compared to other vendors.

Spatial autocorrelation analysis offers opportunities for food environment research to classify areas as hotspots for healthy or unhealthy food groups. This can facilitate targeted

interventions for areas at higher risk for NCD, resulting from more hotspots for unhealthy food groups. In addition, characterising vendors based on healthy or unhealthy food groups could help identify which vendors should be promoted to help improve the food environments to avail more healthy food groups across different geographical contexts

Keywords: Food environment, food vendors, healthy foods, spatial autocorrelation, unhealthy foods