International Journal of Population Data Science

Journal Website: www.ijpds.org

Overcoming the misrepresentation of disease burden associated with single aggregation choropleth maps through combining information from many aggregations.

Tuson, M¹, Yap, M¹, Kok, MR¹, Boruff, B¹, Murray, K¹, Vickery, A¹, Turlach, B¹, and Whyatt, D^{1*}

¹University of Western Australia

Background

Accurate disease mapping based on spatiotemporal data is an important aspect of public health surveillance, targeting interventions, and health service planning. This is achieved by public health surveillance organisations around the world through the construction of choropleth maps based on single spatiotemporal aggregations of finer resolution data. However, such maps are undermined by their dependence on the spatiotemporal units used. This dependence is described by the related modifiable areal and temporal unit problems (MAUP; MTUP), also known as change of support problems (COSP).

Conclusion

Health surveillance organisations continue to produce single aggregation choropleth maps of disease, without acknowledging their limitations except in rare cases. Producing such maps and suggesting they should guide policy makers, while being aware of but not acknowledging the impact of COSPs, could be described as scientific malfeasance. However, assuming that most researchers producing such maps are not intending to mislead, we must conclude that COSPs are poorly understood and their impact underestimated. The zonation overlay method we describe can help alleviate the consequences of this continued practice.

Aim

To accurately map disease.

Methods

Using ischaemic stroke admissions and mental health-related ED presentations in metropolitan Perth between 2013 and 2016 as exemplars, we present a novel zonation overlay approach for disease mapping. This method involves aggregating fine resolution spatial data numerous times instead of just once, using the automated zonation construction software AZ-Tool.

Results

Through implementing the zonation overlay method in combination with a rolling window of time, both the MAUP and the MTUP may be overcome in the context of disease mapping. Furthermore, the AZTool zonations act as a geographical encryption key, allowing fine resolution, precise maps to be constructed while protecting the privacy of individuals.

*Corresponding Author:

Email Address: david.whyatt@uwa.edu.au (D Whyatt)