

Communicable Disease Spatiotemporal Cluster Detection: Leveraging Data to Prevent Infection

Introduction: Hot spot analysis or spatial cluster analysis is a frequently used approach in identifying where infectious disease outbreaks have occurred in the past or are currently occurring. This became increasingly evident during the COVID-19 pandemic, when COVID-19 maps were widely used to convey where COVID-19 infections or death were most prevalent. These clusters may change significantly over time, making the importance of real time prediction of markers of clusters a potential tool in infection prevention.

Hypothesis: There may be markers of a spatiotemporal cluster early on in a time series.

Objectives: This scoping review will determine methods for identifying when within a time series a spatial infectious disease cluster forms. The review examined what methods of spatiotemporal cluster identification have been used to identify those most at risk of infection within a time series.

Methods: Literature was reviewed within PubMed, MEDLINE, Scopus, Google Scholar, and Web of Science. The literature review was conducted using Covidence, a web-application that allows for reviewer collaboration. Descriptive statistics on the final body of literature were conducted in R-Studio.

Results: The scoping review initially included 490 papers, which contained 82 duplicates in total. 209 studies were deemed irrelevant through abstract and title review. The remaining studies' full text were reviewed and included or excluded individually. Exclusion reasons were: conference papers, infections not modelled, and not a time series (we defined as 3 or more time points). The primary method of spatiotemporal infectious disease identification is the use of the SCAN statistic, which can be prospective or retrospective.

Conclusions: The modelling mechanisms for forecasting spatiotemporal infectious disease should be contrasted with the use of real data to determine methods that are best suited for integration into public health policy.

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