CHARMAINE DEAN, University of Waterloo

Spatiotemporal patterns and risk factors of Scarlet fever in Beijing based on a generalized additive modeling framework

Scarlet fever is an acute respiratory infectious disease spread through respiratory droplets or direct contact. In recent years, re-emergence of this disease has been becoming a great threat to global health. However, few studies have investigated its spatial-temporal distribution at the high spatial resolution, the complex interacting effect of environmental factors (temperature, humidity, and PM2.5) as well as the relative importance of risk factors, which are all important for prevention purposes. The surveillance data of Scarlet fever for children aged 1 to 9, in Beijing from 2008 to 2013 from the Beijing Center of Disease Control with detailed and rich geographical information provided us a unique opportunity to explore the spatial-temporal patterns of Scarlet fever by aggregating the data over a grid of 1041 cells. Generalized additive modeling with a thin plate spline for the spatial coordinates and a tensor product smooth for a three-way interaction of the meteorological variables was used to examine incidence patterns. Due to the differing patterns of incidence over 2008-2010 in comparison with 2011-2013, we analyzed the two time periods separately. Both analyses consistently showed that spatial effects were the greatest significant contributor to the prediction after adjusting for age, gender, month and weather variables. Three-way interaction of meteorological variables revealed a complex interaction with significant effects. Comparatively, demographic variables such as gender and age had a much smaller impact than both the spatial and meteorological interaction effects.