SMOOTHING MODELS FOR FACILITATING THE DETECTION OF HOT SPOTS

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Disease maps are geographical maps of local risk estimates. Raw risk estimates tend to be unstable when a disease is rare and/or the population is small. Bayesian *spatial* smoothing increases the stability by pulling the estimate towards a weighted average of its geographical neighbors risks. While *temporal* smoothing pulls the extreme estimate toward the risks at contiguous time points. Typically, spatial smoothing models are applied to disease counts that are pooled across several time periods. Although this helps to ensure that risk estimates are more stable, the temporal correlation can no longer be exploited as a means of stabilizing the estimates. This research examines the accuracy of risk estimation for areas with truly elevated risk (so called ‘hot spots’).

The goals of this study are two-fold. First, we compare the accuracy of ‘hot spot’ risk estimation using the empirical Bayes and fully Bayesian methodologies in order to determine whether fully Bayesian models have a greater tendency to ‘oversmooth’ the elevated risks. In addition, we examine changes in accuracy from including a temporal term i.e. from estimating the risk for each time period and pooling the estimates over time versus a simple spatial smoothing of the risk from pooled counts. This allows us to explore whether the temporal information is able to compensate for the increased variability associated with estimation at each time point.