

# Multivariate modelling of time series of infectious disease counts

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Surveillance data on infectious diseases usually consist of weekly counts of new infections in defined geographical areas. A main challenge is the analysis of the spatio-temporal spread of the disease. In this talk, we will describe the modelling approach proposed by Held et al. (2005) and present multivariate extensions. The model is based on a Poisson or negative binomial observation model with two components: a parameter-driven component describing endemic seasonal patterns and an observation-driven component describing epidemics. The observation-driven component is modeled by autoregression on the number of cases at previous time points in the region as well as in suitably defined neighbouring regions. Maximum Likelihood estimates of the model parameters are obtained using numerical optimization techniques. A main focus will lie on the illustration of the approach analyzing data on influenza mortality in the USA. Geographical adjacency as well as data on air travel within the USA are used to define neighbourhood structures.

## References

Held, L., Höhle, M. and Hofmann, M. (2005). A statistical framework for the analysis of multivariate infectious disease surveillance counts, *Statistical Modelling* **5**: 187–199.