

# Bayesian back-projection and its application to foodborne disease outbreaks

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## Abstract

Back-projection is a statistical method for determining the unknown exposure time in an outbreak data set containing onset time. For an individual, the exposure time is the time period from being infected to symptom occurrence, also called incubation time. Bayesian back-projection is an approach for unknown exposure time estimation. In this thesis, we applied this method to foodborne disease outbreaks data. In our mathematical modelling, informative and non-informative priors have been tested. Uniform and flat Gamma distributions were implemented as non-informative priors. We also tested parametric and non-parametric Empirical Bayesian approaches on data originating from large gastrointestinal disease outbreak, which occurred in Germany 2011. The data come from Robert Koch Institute, the federal public health institute in Germany. The disease incubation period probability distribution was also given by estimates from the Robert Koch Institute. Our data analysis in 686 adult HUS patients indicates that Bayesian approaches lead slightly different results from the EM back-projection method for the point estimate. Under Bayesian approaches, MCMC simulation enable us directly obtain a credible interval.

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