

Publication

Bayesian analysis of zero inflated spatiotemporal HIV/TB child mortality data through the INLA and SPDE approaches : applied to data observed between 1992 and 2010 in rural north east South Africa

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Longitudinal mortality data with few deaths usually have problems of zero-inflation. This paper presents and applies two Bayesian models which cater for zero-inflation, spatial and temporal random effects. To reduce the computational burden experienced when a large number of geo-locations are treated as a Gaussian field (GF) we transformed the field to a Gaussian Markov Random Fields (GMRF) by triangulation. We then modelled the spatial random effects using the Stochastic Partial Differential Equations (SPDEs). Inference was done using a computationally efficient alternative to Markov chain Monte Carlo (MCMC) called Integrated Nested Laplace Approximation (INLA) suited for GMRF. The models were applied to data from 71,057 children aged 0 to under 10 years from rural north-east South Africa living in 15,703 households over the years 1992-2010. We found protective effects on HIV/TB mortality due to greater birth weight, older age and more antenatal clinic visits during pregnancy (adjusted RR (95% CI)): 0.73(0.53;0.99), 0.18(0.14;0.22) and 0.96(0.94;0.97) respectively. Therefore childhood HIV/TB mortality could be reduced if mothers are better catered for during pregnancy as this can reduce mother-to-child transmissions and contribute to improved birth weights. The INLA and SPDE approaches are computationally good alternatives in modelling large multilevel spatiotemporal GMRF data structures. (C) 2012 Elsevier B.V. All rights reserved.

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