

Bayesian Emulation and Calibration of a Dynamic Model for an H1N1 Influenza Epidemic

Marian Farah, MRC Biostatistics Unit

We consider parameter estimation for an H1N1 influenza epidemic model using a computationally expensive dynamic computer simulator for disease transmission and time series epidemic data. In particular, the simulator output is embedded in the likelihood for the epidemic data, making Bayesian inference based on MCMC algorithms impractical due to the computational burden of running the simulator. We show how the simulator output can be approximated efficiently and accurately using a statistical model (the emulator), which we construct using a prior model that combines a Gaussian process with a nonstationary dynamic linear model for the simulator output. The emulator is then used with time series epidemic data to efficiently estimate key epidemic model parameters within a unified Bayesian calibration framework.

Joint work with: Paul Birrell, MRC Biostatistics Unit, Cambridge, UK. Stefano Conti, Statistics Unit, Health Protection Agency, London, UK. Daniela De Angelis, MRC Biostatistics Unit, Cambridge, UK, and Statistics Unit, Health Protection Agency, London, UK.