Abstract

Expected value of sample information (EVSI) involves simulating data collection, Bayesian updating, and re-examining decisions. Bayesian updating in incomplete data models typically requires Markov chain Monte Carlo (MCMC). This paper describes a revision to a form of Bayesian Laplace approximation for EVSI computation to support decisions in incomplete data models. We develop the approximation, setting out the mathematics for the likelihood and log posterior density function which are necessary for the method. We compare the accuracy of EVSI estimates in a case study cost-effectiveness model using 1st and 2nd order versions of our approximation formula and traditional Monte Carlo. Computational efficiency gains depend on the complexity of the net benefit functions, the number of inner level Monte Carlo samples used, and the requirement or otherwise for MCMC methods to produce the posterior distributions. This methodology provides a new and valuable approach for EVSI computation in health economic decision models and potential wider benefits in many fields requiring Bayesian approximation.