

Title A comparison of three modelling approaches for quantitative risk assessment using the case study of *Salmonella* spp. in poultry meat

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Abstract

A comprehensive review of both the scientific literature and industry practices was undertaken to identify and quantify all sources of contamination throughout the entire poultry meat production chain by *Salmonella* spp. This information was used to develop a quantitative risk assessment (QRA) model for *Salmonella* in the production chain from the breeder farm to the chilled carcass. This was subsequently used as the basis on which to compare the merits of three approaches to QRA modelling in such systems. The original model used a Bayesian Network (BN). The second method was a Markov chain Monte Carlo (MCMC) approach, a numerical Bayesian technique which retained a similar network structure but allowed further development, such as the separation of variability and uncertainty. The third method was a more detailed simulation model.

The BN responds immediately to changes, such as entering evidence, because it does not use simulation and can propagate information from any point in the network to all others by Bayesian inference. However, it requires all the variables to be discrete, which introduces errors if continuous variables have to be discretized. These errors can accumulate. The MCMC approach does not require discrete variables while retaining some of the properties of the BN model, such as the ability to draw inferences from evidence. Finally, the simulation offers greater flexibility, such as consideration of the individual carcass, but may be more complex to implement as a result and sacrifices the ability to propagate evidence.