fluSensitivity

Natasha Wenzel

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1 Posterior Contact Matrices

Along with the unknown parameters of interest sampled from the covariance matrix, the adaptive mcmc contained in the `R` package `fluEvidenceSynthesis` re-samples the age structured contact data observed during the POLYMOD study in 2008. For each iteration of the model a row element of the observed POLYMOD data for the specified country is replaced with a randomly drawn row element from the same data. Thus the contact matrix during each iteration of the adaptive markov chain monte carlo is the result of a random re-assortment of the contact data.

Thus the accumulated contact matrices for each accepted markov step represent a posterior distribution for each age and risk group interaction. We assume the contact matrix is symmetric and include the diagonal. For every symmetric matrix of nxn we expect $(n + n^2)/2$ unique interactions.

1.1 Examining standard deviation in the posterior

After 10000 iterations of `adaptiveMCMC` we evaluated the posterior distribution for each age and risk group interaction. In this scenario we included equal risk across all groups, and seven age groups: <1, 1-4, 5-14, 15-24, 25-44, 45-64, and 65 years and over. Standard deviation was evaluated as

$$\sqrt{1/N \sum_{n=2}^{N-1} (x_{n+1} - x_1)^2}$$

where we assume the initial interaction represents the mean of the prior.

The greatest variation was observed in the ¡1 symmetric interaction group (Figure 1), with other symmetric groups demonstrating more variability than their asymmetric interactions.

1.2 Comparing the prior and posterior distribution for interactions

Uncertainty surrounding an interaction rate is not included in standard uses of contact matrices. Returning to the observed contact data from POLYMOD we

drew a random number, n, from the total number of observations then made n random draws from the POLYMOD row ids. The content of the drawn row ids were replaced with the content of an equivalent number of draws from the same data set. This re-sampling process was repeated 10000 times to create 10000 contact matrices from the observed data. The new contact matrices were used to estimate the prior distribution of the observed POLYMOD contact matrix. Below we compare the prior and posterior distribution for age group interactions in eight countries included in the POLYMOD dataset with data including weekdays and weekends but not summer recess holidays.

1.3 Analysis of prior and poster distribution for contact matrix interactions

In general the posterior distributions of the contact matrix are constrained and sufficiently different from the prior that we can conclude that the results are being augmented by both data and prior.