Introduction to Bayesian Statistics

Practicum 5

Using WinBugs to compare means and proportions

**Proportions**

In a study by Hamdanio et al (J Affective Dis 2012), it was found, in a case-control study of people with bipolar disorder (n=110) and healthy controls (n=106), that 80 and 41 of the cases and controls, respectively, were seropositive to toxoplasmosis.

1. Use a Bayesian approach to assess if toxoplasmosis seropositivity is associated with bipolar disorder. Use uniformative priors for the proportion of exposure to toxoplasmosis in each group. To do so, estimate the odds ratio of the association between seropositivity to toxoplasmosis and bipolar disorders and its 95%BCI. You will have to compare the toxoplasmosis exposure odds of bipolar disorders to the odds in the control. Recall that odds = probability/(1-probability), so you can code this in Winbugs such as

odds.cases<-p.exp.cases/(1-p.exp.cases)

odds.control<-p.exp.ctr/(1-p.exp.ctr)

odds.ratio<-odds.exp.cases/odds.exp.ctr

1. Compute a Bayesian p-value to test the research hypothesis that the odds of toxoplasmosis among those with bipolar disorder is > 1 compared to controls. Report the p-value for this test along with a 95% credible interval and interpret the results.
2. Assess the convergence of your model
3. A group of experts is convinced that the association between toxoplasmosis and bipolar disorder is about 2. How could you include such prior information in the analysis?

**Means**

Recall from practicum 4 we used a data set containing fecal coliform contamination on the hands of children and educators in day care centers in Québec, Canada. Previously, you obtained estimates and 95% Bayesian credible intervals of the log10 fecal coliforms on the hands of both children and educators. The next question to ask is if the number of fecal coliforms on the hands of children and educators differ.

1. Write a model in WinBugs to estimate the mean difference between the number of fecal coliforms on the hands of children and educators and its 95% BCI. Note that the unit of analysis is the classroom here, so we have as many observations as there are classrooms. You may use the same priors as before in practicum 4 and the uniform distribution on the SD.
2. Compute a Bayesian p-value to test the research hypothesis that the log10 fecal coliform counts on the hands of children are greater than those on the hands of educators. Report the p-value for this test along with a 95% credible interval and interpret the results.
3. Assess the convergence of the model