The University of Hong Kong
School of Public Health

Master of Public Health
Advanced Statistical Methods II
July 19, 2023

Assignment 3 – Bayesian inference
(***Submit to Moodle by 23:55, August 5, 2023 (after final exam)***)

Prior and posterior distribution (also refer to Practical 9)

We observed 60 cases of asthma out of 568 children in Hong Kong. It is assumed that the number of asthma cases follows a binomial distribution $X \sim \text{Bin}(n,\theta)$.

1. Suppose the researcher believed that the asthma incidence cannot be less than 0.1, and a uniform distribution for the prior for θ is assumed. Obtain and plot the posterior distribution for θ. [4 marks]

2. Based on question (1), what is the estimate and the corresponding 95% credible interval for θ? [2 marks]

3. Suppose the researcher believed that the asthma incidence cannot be less than 0.13, and a uniform distribution for the prior for θ is assumed. Obtain and plot the posterior distribution for θ. [4 marks]

4. Based on question (3), what is the estimate and the corresponding 95% credible interval for θ? [2 marks]

5. Suppose the researcher (wrongly) believed that the asthma incidence cannot be less than 0.2, and a uniform distribution for the prior for θ is assumed. Obtain and comment on the posterior distribution for θ. [3 marks]

6. Comment on the impact of selected priors on the final estimates. [2 marks]