Practical 9

**Simulate prior and posterior distribution: beta-binomial model**

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 $Y \sim Bin(n,\theta)$. Suppose the subjective prior for $\theta$ is a Beta(6.6, 60) distribution. Theoretically we know that the posterior distribution for $\theta$ is Beta(66.6, 568), but we like to confirm it by simulation.

1. Draw 100,000 samples from the prior distribution for $\theta$ and plot the distribution.

2. For each of the 100,000 simulated $\theta$ from the prior distribution, draw a corresponding random sample Y from the binomial distribution with n=568.

3. Plot the scatter plot between $\theta$ and y.

4. Given that we observed y = 60, obtain the posterior distribution of $\theta$.