Bayesian Clinical Trials

Informative vs. non-informative beta priors

Updatindg with Data

```
library(LearnBayes)
```

Suppose we are interested in the response p of a drug.

- The function **bayes.select** allow for specifying a beta prior based on knowledge of two prior quantiles.
- Suppose the prior median for the response rate is 0.2 and the 75th percentile is 0.3.

```
beta.prior = beta.select(list(p=0.5, x=0.2),
list(p=0.75, x=.3))
print(beta.prior)
```

```
## [1] 2.04 7.19
```

A beta(2.04, 7.19) prior matches this prior information

Updating with data

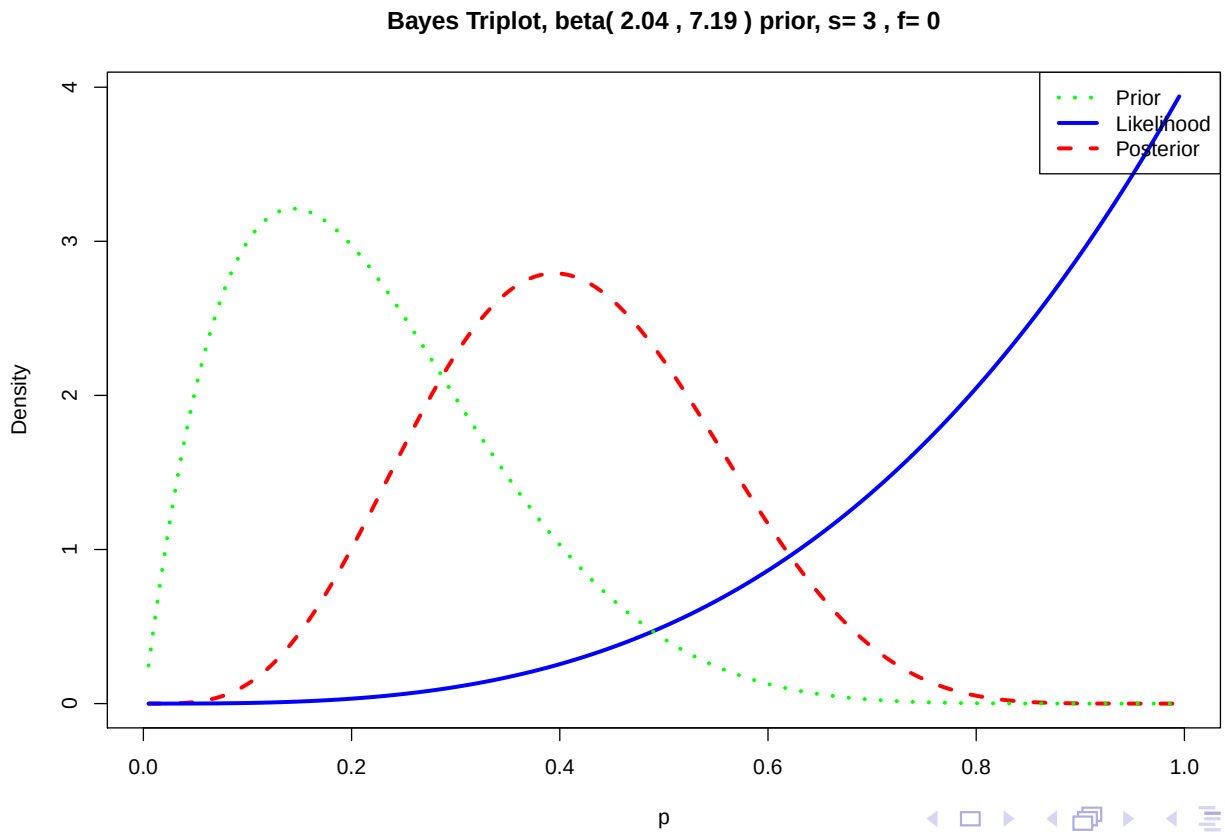
- Next, suppose to observe for 3 successive patients no adverse events
  - 3 successes and 0 failures

The posterior distribution is. . .

Triplot

The triplot function shows the prior, likelihood, and posterior on the same display

```
beta.prior = beta.select(list(p=0.5, x=0.2),
                         list(p=0.75, x=.3))
triplot(beta.prior, c(3,0))
```



Inference by sampling from the posterior

Inference about the response rate can be carried out by simulating a large number of draws from the posterior and summarizing the simulated sample.

```
beta.prior = beta.select(list(p=0.5, x=0.2),
                         list(p=0.75, x=.3))
beta.post = beta.prior + c(3,0)
post.sample = rbeta(1000, beta.post[1], beta.post[2])
quantile(post.sample, c(0.05, 0.95))
```

```
##         5%        95%
## 0.1945582 0.6494222
```

Predictive distribution

Suppose we want to predict the number of no adverse events (successes) in the next cohort of 3 patients.

```
beta.prior = beta.select(list(p=0.5, x=0.2),
                         list(p=0.75, x=.3))


n = 3
s = 0:n
pred.probs = pbetap(beta.prior, n, s)
discint(cbind(s, pred.probs), 0.95)
```

```
## $prob
## [1] 0.9763719
##
## $set
## [1] 0 1 2
```

Predictive distribution