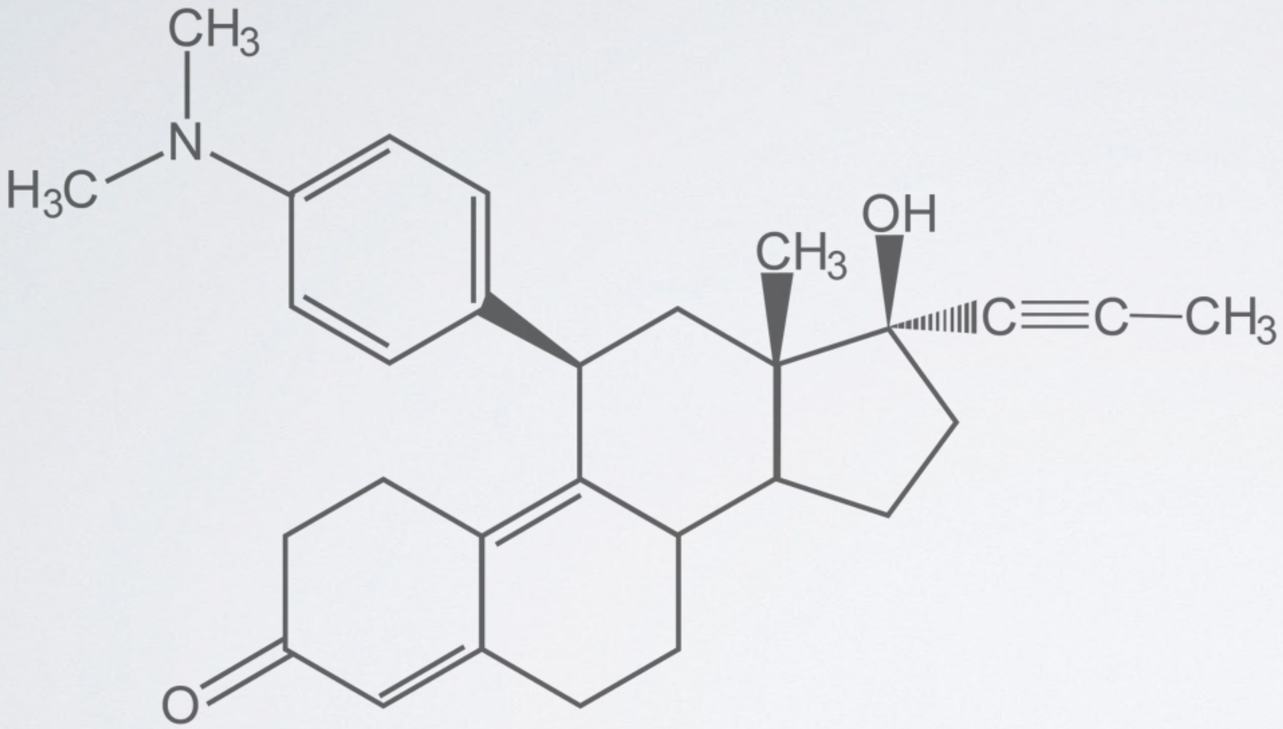
inference on a binomial proportion

Dr. David Banks
Duke University

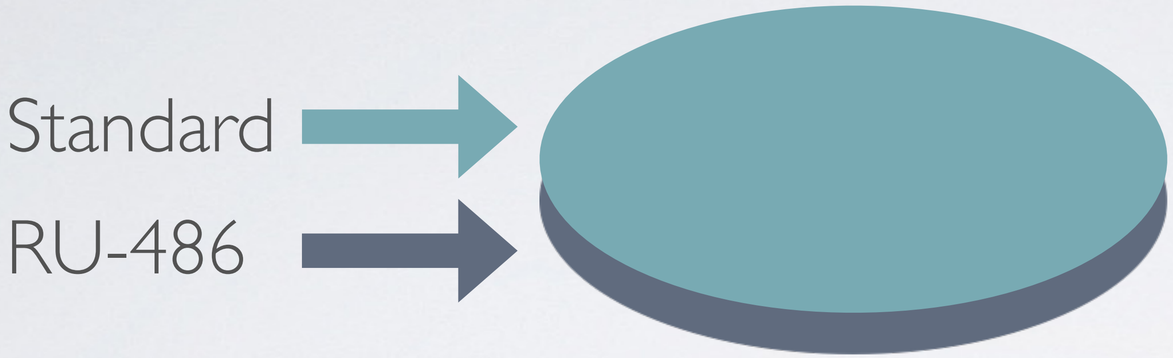
RU-486 morning-after contraceptive



clinical trial details

- 800 women
- sexual intercourse in previous 72 hours
- randomly assigned

RU-486 treatment	**standard treatment**
0 pregnancies	4 pregnancies


Standard
RU-486

frequentist approach

$H_O : p \geq 0.5$ vs $H_A : p < 0.5$

P-value $= 0.5^4 = 0.0625 > 0.05$

do not reject null hypothesis

Bayesian approach

uniform distribution beta(1,1)

posterior probability beta(1+0,1+4)

Bayesian mean

the mean of a beta (α, β) distribution

$$\alpha/(\alpha+\beta)$$

$$p = 1/6$$

Bayesian standard deviation

the standard deviation of a beta (α, β) distribution

before data: $p = 0.71$

after data: $p = 0.13$

$$\boxed{0.96875}$$

$p < 0.5$ $p > 0.5$

summary

- how to build a **statistical model**
- frequentist vs. Bayesian approaches lead to **different** conclusions
- Bayesian approaches learn from **data**
- yesterday's posterior is **today's prior**