inference for a proportion - frequentist approach

Duke UNIVERSITY

Dr. Mine Çetinkaya-Rundel

morning after

- **research question:** Is RU-486 an effective "morning after" contraceptive?
- **participants:** 40 women who came to a health clinic asking for emergency contraception
- **design:** Random assignment to RU-486 or standard therapy (20 in each group)
- **data:**
  - 4 out of 20 in RU-486 (treatment) became pregnant
  - 16 out of 20 in standard therapy (control) pregnant
- **question:** How strongly do these data indicate that the treatment is more effective than the control?

framework

- simplification: one proportion
  - consider the 20 total pregnancies
  - question: How likely is it that 4 pregnancies occur in the treatment group?
- if treatment and control are equally effective + sample sizes for the two groups are the same

P(pregnancy comes from treatment group)
$= p = 0.5$

hypotheses

$p =$ probability that a given pregnancy comes from the treatment group

$H_0 : p = 0.5$ - no difference, a pregnancy is equally likely to come from the treatment or control group

$H_A : p < 0.5$ - treatment is more effective, a pregnancy is less likely to come from the treatment group

p-value

- $k = 4$ and $n = 20$ - since there are 20 pregnancies total, and 4 occur in the treatment group
- $p = 0.5$ - assuming H_0 is true
- p−value $= P(k \leq 4)$

```
sum(dbinom(0:4, size = 20, p = 0.5))
```

```
## [1] 0.005908966
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