

inference for a proportion - frequentist approach

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

$$P(\text{pregnancy comes from treatment group}) \\ = p = 0.5$$

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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