Agenda

1. Exam 1 Recap

2. Randomization test recap

3. Hypothesis Testing

Randomization test recap   Recall the randomized simulation that we performed in the last class. Our goal was to assess the likelihood that exposure to mites was associated, *to a statistically significant* degree, with a decrease in wilt disease after exposure to Verticillium, a fungus that causes wilt disease.

1. What was the *null hypothesis* for your simulation?

2. What was the *test statistic*?

3. Where did the test statistic lie in the *null distribution*?

4. Did this evidence cause you to *reject* or *fail to reject* the null hypothesis?

5. Write *one* sentence to Oprah Winfrey summarizing what you've learned about mites and wilt disease.

```
require(mosaic)
tally(~ outcome + treatment, data = Mites)

##          treatment
## outcome    mites no mites
##   no wilt    15        4
##   wilt       11       17


null_dist <- do(5000) * tally(~ outcome + shuffle(treatment), data = Mites)
ds <- tidyr::gather(null_dist, key = type, value = N)
qplot(data = ds, x = N, facets = ~type, binwidth = 1)
```
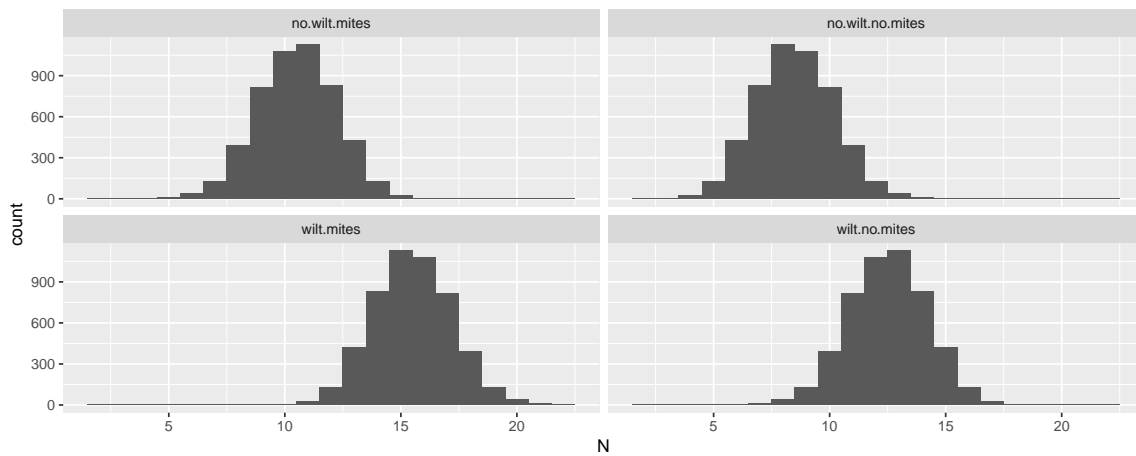
```
2 * pdata(~N, q = 11, data = filter(ds, type == "wilt.mites"))

## [1] 0.0128

2 * pdata(~N, q = 17, data = filter(ds, type == "wilt.no.mites"), lower.tail = FALSE)

## [1] 0.0028

2 * pdata(~N, q = 15, data = filter(ds, type == "no.wilt.mites"), lower.tail = FALSE)

## [1] 0.0028

2 * pdata(~N, q = 4, data = filter(ds, type == "no.wilt.no.mites"))

## [1] 0.0128
```

What's Wrong?   Here are several situations where there is an incorrect application of the ideas presented in this section. Write a short paragraph explaining what is wrong in each situation and why it is wrong.

1. A researcher tests the following null hypothesis: $H_0 : \bar{x} = 23$

2. A study with $\bar{x} = 45$ reports statistical significance for $H_a : \mu > 50$.

3. A researcher tests the hypothesis $H_0 : \mu = 350$ and concludes that the population mean is equal to 350.

4. A test preparation company wants to test that the average score of their students on the ACT is better than the national average score of 21.1. They state their null hypothesis to be $H_0 : \mu > 21.2$.

5. A study summary says that the results are statistically significant and the p-value is 0.98.