Inference through Randomization

Researchers suspect that the attack on a plant by one organism induces resistance to subsequent attacks by a different organism. Individually potted cotton plants were randomly allocated to two groups: one group that was infested by spider mites; and another group that was not. After two weeks the mites were dutifully removed by a conscientious research assistant, and both groups were inoculated with Verticillium, a fungus that causes wilt disease. The following table shows the number of plants that developed symptoms of wilt disease.

```
mosaicData::Mites |>
  janitor::tabyl(outcome, treatment)
```

```
 outcome mites no mites
 no wilt    15        4
    wilt    11       17
```

Big question: Is there a relationship between infestation and wilt disease? Conduct a randomization test *for a difference in proportions* to determine if there is a statistically significant association between innoculation via mites and resistance to wilt disease.

Setup hypothesis test

1. Write down what you know. Complete the two-way table above by filling out the margins.

2. What is the test statistic? Use mathematical notation.

3. Choose an α-level.

4. Write down your null and alternative hypotheses.

Simulate the null distribution

Your objective is to answer the big question using a simulation of your own design. You may want to refer back to the yawning activity that we did on the first day of class. You're welcome to use the cards in whatever manner is most useful. *Outline your procedure in detail* below, and be sure to touch on the following questions.

1. What does each card represent?

2. Upon what assumptions does your simulation rely?

3. What role does randomization play in the simulation?

4. Record your simulated null distribution below as a dot plot.

5. Where does the observed statistic fall in this distribution? *Estimate* the p-value.

6. What conclusions do you draw concerning the association of mites and wilt disease?

7. What is the practical significance of your result?

Randomization test using `infer`

1. Write code using the `infer` package to conduct the hypothesis test.

2. Compare your p-value to the one you calculated above. Do you reach the same conclusions?