

Hypothesis Testing

What is a hypothesis?

- Educated guess
- Test that guess with statistics

Null vs. Alternative

Null

- Equal =
- No difference
- Status quo

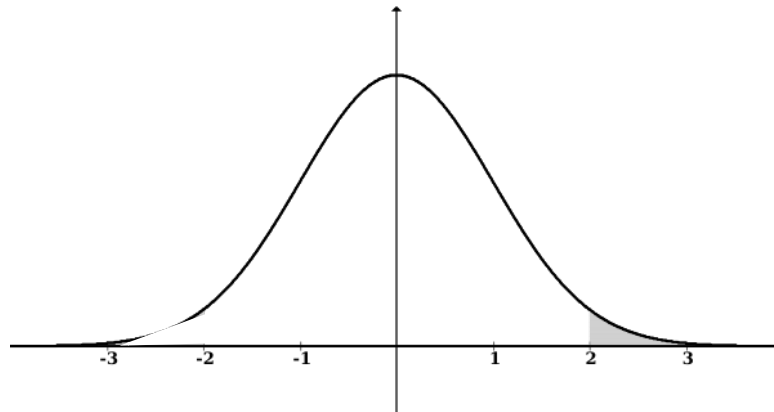
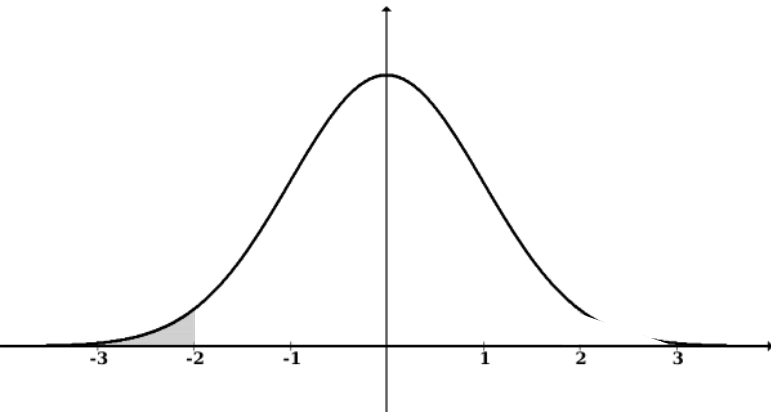
Alternative

- Unequal !=
- Difference
- Something unusual

Alternative is Special

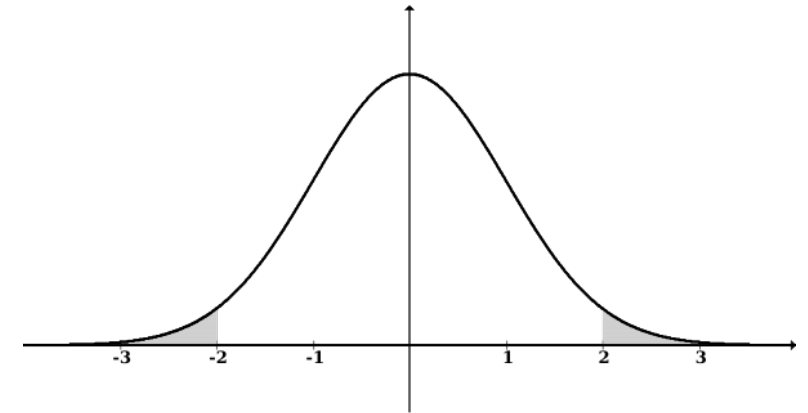
One-Tailed

- You specify HOW they are different
- Higher or lower?



Two-Tailed

- JUST different



Scenario Practice

Polar bears live both in the wild and in zoos. You want to find out if the percentage of polar bears is the same in the wild and in zoos.

- Null: The percentage of polar bears is the same in the wild as it is in a zoo.
- Alternative: The percentage of polar bears in the wild is different than the percentage of polar bears in zoos.
 - One tailed: There are more polar bears in the wild than in zoos.
 - One tailed: There are more polar bears in the zoo than in the wild.

Is the number of pillows on my bed different than the household average?

- Null: There is no difference between the number of pillows on my bed and the household average.
- Alternative: There is a difference between the number of pillows on my bed and the household average.
 - One tailed: I have more pillows than the household average.
 - One tailed: I have fewer pillows than the household average.

Which streaming service is preferred by Americans: Netflix or Hulu?

- Null: An equal number of Americans watch Netflix and Hulu.
- Alternative: The number of viewers differs between streaming service.
 - One tailed: Americans prefer Netflix.
 - One tailed: Americans prefer Hulu.

Accepting or Rejecting the Null

The p value

- p is for probability
- A statistic tests the probability that the null hypothesis is true
- The smaller, the better for finding significant results

The α value

- The benchmark that you are testing your statistic against
- Three typical alphas:

α level	Accuracy Chance (Probability)	Error Chance
.01	99%	1%
.05	95%	5%
.10	90%	10%

The Decision Rule

- If $p \leq \alpha$: reject the null
- If $p > \alpha$: accept the null

The Decision Rule, $\alpha = .05$

- If $p \leq .05$: reject the null
- If $p > .05$: accept the null

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 - One tailed: There are more polar bears in the wild than in zoos.
 - One tailed: There are more polar bears in the zoo than in the wild.
- $p = .03$ – Reject the null

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- $p = .06$ – Accept the null

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Making Hypothesis Mistakes

Error

Type I

- Reject the null when you shouldn't
- Say there's a difference when there's not
- False Positive

Type II

- Accept the null when you shouldn't
- Say there's no difference when there is
- False Negative

Type I Error



Null: Visible

Alternative: Invisible

Calvin rejected the null when he shouldn't have!

Type II Error



Null: Garfield can't ruin the drapes

Alternative: Garfield can ruin the drapes

John accepted the null when he shouldn't have!

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- Type I error: Accept the null

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- $p = .06$ – Accept the null
- Type II error – Reject the null

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Questions?