§9.1B: Error and Power

Skills

- Identify Type 1 and Type 2 errors
- Describe errors in context
- Understand what factors affect the probabilities of Type 1 and Type 2 errors, and Power

Consequences

Just because we have evidence against the null doesn't mean that the null is false

We might make an error

Similarly, when we have little/no evidence against the null, that doesn't mean that the null is true

In either case, we might make an error

Errors

There are four possibilities

	Fail to Reject Ho	Reject Ho
Null is true	☺	
Null is false		☺

Type 1 Errors

This occurs when you reject the null, but the null is actually true
You can't know if you've made this error, but you *can* calculate the probability

The probability of a Type 1 error is α
A consequence of deciding how much evidence you need is in selecting the probability of making a Type 1 Error.

Type 2 Errors

This occurs when you fail to reject the null hypothesis, but the null really is false
It is a bit harder to calculate the probability of a Type 2 error (β)
There are multiple factors that affect its value—two more so than others

- Significance Level
- Sample size

Power

The probability of rejecting the null when the null is actually false

This is the complement of the probability of a Type 2 error (power = $1 - \beta$)

When one goes up, the other goes down

Example

An old report says that 17% of the candy in a mixed bag is dark chocolate
I test this against the belief that the actual proportion is lower
Describe a Type 1 error
Describe a Type 2 error

Example

A restaurant can only succeed if a certain number of people come in each day
A prospective owner tests the null (enough people come) against an alternate (too few people come)
Describe both types of errors in context
What are the consequences of each error?
Which error is more serious?

...now try some problems!