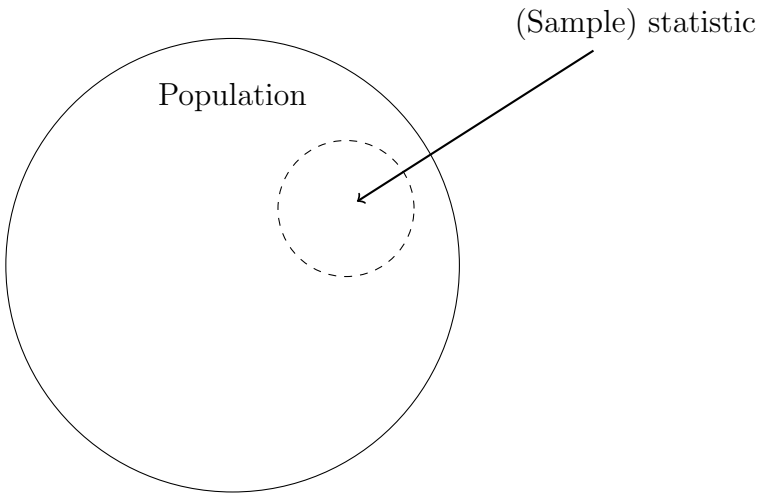
Introduction to Type I and Type II Errors:

Significance Test:

Define a null and alternative hypothesis for a population in question. Using a sample of the population, calculate a statistic that can estimate something about the population. (The parameter in question.)

$$H_0 : \text{Null Hypothesis (status quo)} \qquad H_a : \text{Alternative Hypothesis (something different)} \tag{1}$$



p-value

Using the statistic, find the probability of getting that statistic, given the null hypothesis is true.

$$\text{p-value} = P(\textit{statistic} \mid H_0 \text{ true}) \tag{2}$$

If the p-value is less than the significance level, then the null hypothesis is rejected:

$$\text{p-value} < \alpha \rightarrow \text{reject } H_0 \tag{3}$$

If the p-value is greater than or equal to the significance level, then we fail to reject the null hypothesis:

$$\text{p-value} \geq \alpha \rightarrow \text{reject } H_0 \tag{4}$$

Understanding the Type Errors

- When the null hypothesis is true, if it is rejected, that is a type 1 error.
- When the null hypothesis is false, if it is failed to be rejected that is a type 2 error.

	$\boldsymbol{H_0}$ **true**	$\boldsymbol{H_0}$ **false**
Reject $\boldsymbol{H_0}$	Type I Error	Correct
Fail to Reject $\boldsymbol{H_0}$	Correct	Type II Error