

# **7.2: Inference as Decision**

Type 1 and Type 2 Errors

# Type I and Type II Errors

- If we reject the null hypothesis when the null is true, this is a Type 1 Error (False Positive)
- If we accept the null hypothesis when the alternative hypothesis is true, this is a Type II Error (False Negative)

# Type I and Type II Errors

My D E C I S I O N	The Truth	
	$H_0$ True	$H_a$ True
	Reject $H_0$	Correct Decision
Accept $H_0$	Correct Decision	Type II

**In medical testing,  $H_0$  is usually the assumption that a person is healthy. The alternative is that he or she has the disease.**

- A Type I Error is a False positive; a healthy person is diagnosed with the disease (Reject  $H_0$  even though  $H_0$  true)
- A Type II Error is a False negative; an infected person is diagnosed as disease free (accept  $H_0$  even though  $H_a$  true)

# Jury Trial

- Type I Error: if jury convicts an innocent person (Reject  $H_0$  even though  $H_0$  true)
- Type II error occurs if the jury fails to convict a guilty person (Accept  $H_0$  even though  $H_a$  true)

**A certain potato chip company  
samples chips to see if they meet  
a certain standard.**

**$H_0$ : the batch meets the standard**

**$H_a$ : The chips do not meet the  
standard**

- Type 1: Rejecting a good batch (hurts the company)
- (Reject  $H_0$  even though  $H_0$  is true)
- Type II: Accepts a bad batch (hurts the consumer)
- (Accept  $H_0$  even though  $H_a$  is true)

# How to reduce errors?

- Increase alpha
- Consider a particular alternative farther away from  $\mu$ .
- Increase the sample size
- Decrease sigma