Statistical Significance vs. Practical Importance

- A group of 1000 students have an average GPA of 3.08. Are their GPA's significantly different from the university average of 3.10?

H_0: $\mu = 3.10$

H_A: $\mu \neq 3.10$

$z = -3.16$

p-value $= 0.008$ Reject H_0

Conclusion: Group GPA is (statistically) significantly different from university average

Statistical Significance vs. Practical Importance

- A group of 5 students have an average GPA of 2.95. Are their GPA's significantly different from the university average of 3.10? (Assume the standard deviation is known to be 0.2)

95% confidence interval for μ :

$$2.95 \pm 1.96 \frac{0.2}{\sqrt{5}} = 2.95 \pm 0.18 = [2.77,3.13]$$

Statistical Significance vs. Practical Importance

- A group of 1000 students have an average GPA of 3.08. Are their GPA's significantly different from the university average of 3.10?

95% confidence interval for μ :

$$3.08 \pm 1.96 \frac{0.2}{\sqrt{1000}} = 3.08 \pm 0.01 = [3.07, 3.09]$$

Type I/Type II Errors

		State of Nature	
		H_0 is true	H_0 is false
Decision	Reject H_0	**Type I Error** $P(\mathit{Type\ I\ Error}) = \alpha$	**Correct Decision**
	Do not reject H_0	**Correct Decision**	**Type II Error** $P(\mathit{Type\ II\ Error}) = \beta$

Type I/Type II Errors

Consider the hypotheses

H_0: $\mu = 5$
H_a: $\mu < 5$

Also given: n=16 (sample size) σ=2 (std.dev) α=0.05

- What is the Type II error probability when
  a) $\mu = 4.8$?

Type I/Type II Errors

Consider the hypotheses

H_0: $\mu = 5$
H_a: $\mu < 5$

Also given: n=16 (sample size) σ=2 (std.dev) α=0.05

- What is the Type II error probability when
  b) $\mu = 3$?
- How is the Type II error probability affected by
  a) changing the significance level α?
  b) changing the sample size n?