

STA 291

Lecture 29

- ***Review***

Final Exam, Thursday, May 6

- **When: 6:00pm-8:00pm**
- **Where: CB 106**

Make-up exam: Friday 10:00am-12:00noon

- **Only by prior arrangement**
- **Room still unknown, watch the web for update, or come to 8th floor POT on Friday**
- **Update: Makeup room: CB 303**

Final Exam, Thursday, May 6

- It will be approx. one and half length long compared to the two midterms. (i.e. if midterm have 20 questions, final will have approx. 30 questions).
- Similar mixture of open answer questions and multiple choice questions, compared to the midterms.
- Covers all the topics (comprehensive). But more on the later (testing hypothesis, confidence interval) materials.

- Formula sheet and tables will be provided.

Some topics we covered

- Testing hypothesis.
- Confidence intervals. (even though it had been covered in midterm exam II)
- Connection between the above 2 topic.
- Use of Z (Normal) table to find probability
- When to use t-table instead?

- Setting up the correct hypothesis:
 - it is always about a population parameter(s)

- Find the correct formula for the hypothesis
- Computation of the test statistic, and the P-value (Need to use table)
- What to do if falls outside the range of table?

- Reach a conclusion by compare the P-value to the alpha level. (report the P-value)
- Potential error (which type?)

Connection between testing hypothesis and confidence interval

- Given a confidence interval, you can tell if the P-value is above or below alpha
- Given a P-value you can tell if the confidence interval will contain μ_0

- Similar question on Exam II might re-appear on final.

Comparing paired Samples: Example

Student	1	2	3	4	5	6	7	8	9	10
Before	60	73	42	88	66	77	90	63	55	96
After	70	80	40	94	79	86	93	71	70	97

- a) Compare the mean weights after and before the drug by
 - i. finding the difference of the sample means
 - ii. finding the mean of the difference scores. Compare. ---(same)
 - iii. But SD is different, One SD or two SD's?
- b) Calculate and interpret the P-value for testing whether the mean change equals 0
- c) Compare the mean weights after and before taking the drug by constructing and interpreting a 90% confidence interval for the population mean difference

Comparing Dependent Samples: Example (contd.)

Output from Statistical Software Package SAS

N	10
Mean	7
Std Deviation	5.24933858

Tests for Location: $\mu_0=0$

Test	-Statistic-	-----p Value-----
Student's t	t 4.216901	Pr > t 0.0022
Sign	M 4	Pr >= M 0.0215
Signed Rank	S 25.5	Pr >= S 0.0059

Which method to chose?

- Two-year Italian study on the effect of condoms and the spread of AIDS
- Heterosexual couples where one partner was infected with HIV virus
- 171 couples who always used condoms:
 - 3 partners became infected with HIV
- 55 couples who did not always use condoms:
 - 8 partners became infected with HIV
- *Test whether the rates are significantly different. Report the P-value and interpret.*

Which Method to Choose?

- A study compares the mean level of contributions to political campaigns in Pennsylvania by registered Democrats, and registered Republicans.

Which Method to Choose?

- Example: Compare new drug to placebo in a double-blind clinical trial
 - 24 patients
 - Randomly pick 12 assign to placebo
 - The other 12 receive the new drug
 - Research question: Is there a different effect of placebo and new drug on a “response” on, for example, cholesterol, blood parameter, health status, weight,...

Which Method to Choose?

- Example: Which of two suntan lotions (labeled X and Y) provides better protection against sunburn
 - 8 subjects expose their backs to the sun for a certain time, protected by suntan lotion
 - Possible design:
 - Randomly pick 4 subjects use lotion X
 - the other 4 subjects use lotion Y

Which Method to Choose?

- Example: Which of two suntan lotions (labeled X and Y) provides better protection against sunburn
 - 8 subjects expose their backs to the sun for a certain time, protected by suntan lotion
 - Different design:
 - Each of the 8 subjects uses **both** suntan lotions at the same time
 - one lotion on the left side of the back, the other on the right side (use a coin flip to decide which side for X)

Multiple Choice Question

- *Which of the following statements are true?*
- **“95% confidence” means that**
 - 95% of the true population parameters are in the confidence interval
 - If we were to repeat the procedure of sampling and calculating confidence intervals from the same population, then 95% of the population parameters are going to be in every calculated interval
 - If we were to repeat the procedure of sampling and calculating confidence intervals from the same population, then 95% of the times our confidence interval will contain the true population parameter

Multiple choice Q

- If a test turns out to be significant at alpha-level 0.01. (what exactly this mean for the p-value?)
- Will the same test also be significant at 0.05 level?

- P-value is **NOT** the probability that the H0 is true.
- A small p-value mean that we saw something happened that is **hard to explain** by H0

- A large p-value do not automatically means H_0 is true. (2 possibilities: either H_0 is true or there is too few data/info)
- Another H_0 could have even larger P-value

Test vs. Confidence Interval

Assume that the p -value is equal to 0.043 for a test of the null hypothesis $H_0: \mu=2$, with two-sided alternative.

What conclusion can we make about a 95% confidence interval for μ ?

- Study hard and good luck!