STA 291
Lecture 29

- *Review*

Final Exam, Thursday, May 6

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

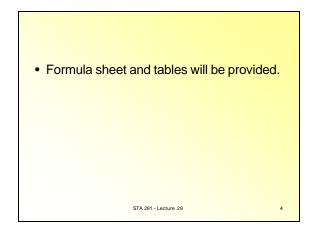**Make-up exam: Friday 10:00am-12:00noon**
- **Only by prior arrangement**
- **Room still unknown, watch the web for update, or come to 8th floor POT on Friday**
- Update: Makeup room: CB 303

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.
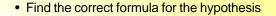
• Use of Z (Normal) table to find probability
• When to use t-table instead?

• 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)
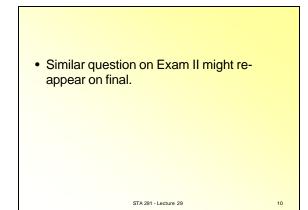
- Potential error (which type?)

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 mu0

- 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

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Comparing Dependent Samples: Example (contd.)

Output from Statistical Software Package SAS

```
   N                          10
   Mean                        7
   Std Deviation     5.24933858

         Tests for Location: Mu0=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

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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)

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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

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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 H0 is true.   (2 possibilities: either H0 is true or there is too few data/info)

- Another H0 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 H0: mu=2, with two-sided alternative.

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

- Study hard and good luck!