SAN JOSÉ STATE UNIVERSITY **College of Social Work**
S. W. 242
Spring 2008
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Week 7: March 7, 2008
Chi-Square Lab
Comparing means of two groups: *t*-tests (+ some introductory material on Confidence Intervals)

On a Snapple bottle top: *"Americans on average eat 18 acres of pizza every day."* What is the average they might be talking about? What kind of an American eats 18 acres of pizza every day?

Concepts you should know:

- Z scores
- Confidence interval of the mean
- Standard error of the mean
- Critical values
- Type I and Type II errors
- Assumptions for using *t*-test
- Equality of variances
- Independent group *t*-test
- Dependent group *t*-test
- Degrees of freedom (and the *t*-test)
- Confidence interval of the difference between means

I. Z Scores and Confidence Intervals

A. **Z score —** a transformation of the raw score (interval/ratio level variable) that tells how many standard deviations the score lies from the mean

1. Formula: (raw score – mean) divided by the sample standard deviation

2. In a large number of randomly selected samples, 2.5% of their means would fall within two standard deviations above population the mean (z score = + 1.96) and 2.5% of their means would fall within two standard deviations below the population mean (z score = -1.96). 95% of the means would fall in the remaining area under the curve.

B. **Confidence interval –** a range into which we would estimate a population parameter to fall based on a sample statistic. The confidence interval of the mean is based on

1. Sample mean

2. Confidence level (e.g. 95%, or 90%, or 99%). 95% is most typical.

3. Amount of variability (standard error of the mean)

    a) **Standard error –** while the standard deviation measures dispersion of the sample data, the **standard error** is a measure of the precision by which the population mean is estimated from the sample (or, the dispersion of means). It assumes a hypothetical distribution of an infinite number of samples (and their means) drawn from the population.

    b) The formula is the *sample's standard deviation divided by the square root of the sample size*. As the sample size (denominator) increases, the standard error becomes smaller. As the dispersion (SD) increases, the standard error increases.

4. So, a 95% CI formula is: Mean ± 1.96*Standard error

5. Example: Our sample of client satisfactions scores have a mean of 40 and standard deviation of 5. We want to be 95% sure of the *true* population mean (meaning we need to know the potential *range* of means).

    a) First we need the standard error: SE = SD/Sq root of sample size

SE = 5/sq root of 100 = 5/10 = 0.5

b) Then the 95% Confidence Interval:

95% CI = Mean ± 1.96*Standard error = 40 ± 1.96*.5
The *lower* limit of the range is 40 - (1.96*.5) = 40 - .98 = 39.02
The *upper* limit of the range is 40 + (1.96*.5) = 40 + .98 = 40.98

c) So we can say that we are 95% confident that any sample we draw will have a mean between 39.02 and 40.98 (which is our best estimate of the population mean) **Repeat this aloud several times.**

6. Wait for the next election poll on the news: *Margin of error* is a one-number indicator of range, or the "radius" of the distance between the upper and lower limit, usually derived from the 95% confidence interval. (In election polls the question is usually "Whom would you vote for?" which results in nominal data summarized as proportions, not ratio data is in above examples. You can also have confidence intervals of proportions.) So you might hear that 40% of registered Democrats surveyed in Pennsylvania will vote for Hillary vs. 39% for Barack, 'with a margin of error of 2.' Which means statistically they're tied!

II. Introduction to the *t*-tests (see powerpoint handout)

III. Next week:

A. Before class: try out the example shown in class—handout to be posted

B. Meet at lab for *t*-test lab assignment

C. We’ll review material for exam, then distribute take home exam

D. Introduction to ANOVA

Class Process Questionnaire -- ScWk 242 Section: __3
__4

Date of Class: _________

Instructions—near the end of class or at anytime after class please complete *any* of these questions and return to the Instructor. **This is *not required* for grade or class participation.** Do not put your name on this sheet.

1. At what point in this class did you feel most engaged?

2. At what point in this class did feel the least engaged?

3. What action or discussion by anyone in the room did you find most helpful?

4. What action or discussion by anyone in the room did you find most confusing?

5. What surprised you most about class today?

6. Is there a topic that we should definitely get back to in the next weeks? Or, any particular types of teaching techniques you would recommend?