HSCC 470
Research Methods and Data Analysis in Health Sciences

Hypothesis Testing III

Using SPSS

Unit Objectives

Upon completion of this unit, the student will be able to:

- List the 6 components of statistically testing a hypothesis
- Test a sample distribution for normality
- Describe the uses of parametric and non-parametric tests
- Describe the uses for the most common statistical tests
- Use statistical tests in SPSS to either accept or reject the null hypothesis

Elements of a Statistical Test

- **Assumptions**
  - Scale of measurement
  - Population distribution
  - Method of sampling
  - Sample size
- **Hypotheses**
  - Null
  - Alternative
- **Select Alpha Level**
- **Test statistic**
- **P-value**
- **Conclusion**

Elements of a Statistical Test continued

- **Assumptions**
  - Scale of measurement
    - Nominal, ordinal, interval, ratio
  - Population distribution
    - Normal (Gaussian) vs. non-normally distributed data
    - Parametric tests for normally distributed data
  - Method of sampling
    - Random
    - Independent vs. dependent
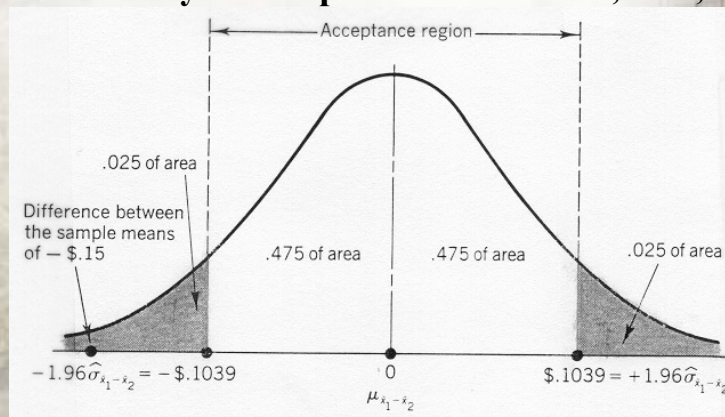 - Sample size
    - Bigger is better

Elements of a Statistical Test continued

- **Hypotheses**

  - Null
  - Alternative

Elements of a Statistical Test continued

- **Select the alpha level**
- **Commonly used alpha levels are 0.01, 0.05, 0.10**

Elements of a Statistical Test continued

- **Test statistic**

Scale of Measurement	Two Treatment Groups Consisting of Different Individuals	Three or More Treatment Groups Consisting of Different Individuals	Before and After a Single Treatment in the Same Individuals	Association Between Two Variables
Interval	Unpaired *t* test	ANOVA	Paired *t* test	Linear Regression and Pearson Correlation
Nominal	Chi-square	Chi-square	McNemar's test	Contingency Coefficients
Ordinal	Mann-Whitney rank-sum test	Kruskal-Wallis statistic	Wilcoxon signed-rank test	Spearman Rank Correlation

Elements of a Statistical Test continued

- *P*-value
  - Gives us the probability of collecting a sample with the observed difference between experimental and control group, *if the null hypothesis were indeed true*
  - Recall that the null hypothesis is that there is no difference between experimental and control groups

Elements of a Statistical Test continued

- **Conclusion**
  - Compare the *p* value with the alpha level
  - If the *p* value is less than or equal to the alpha level, reject the null hypothesis and conclude:
    - **There is a difference between experimental and control groups with respect to this variable**
  - If the *p* value is greater than the alpha level, accept the null hypothesis and conclude:
    - **There is no difference between experimental and control groups with respect to this variable.**

An Example Using SPSS

- **Assumptions**
  - Scale of measurement
    - interval
  - Population distribution
    - normal
  - Method of sampling
    - Random, 2 independent groups (experimental and control)
  - Sample size
    - N = 200 in experimental group
    - N = 200 in control group

An Example Using SPSS continued

- **Hypotheses**

  - Null
    - There is **<u>no difference</u>** in systolic blood pressure between patients who receive MAST in the treatment of hemorrhagic shock, and those who do not.
  - Alternative
    - There is a **<u>difference</u>** in systolic blood pressure between patients who receive MAST in the treatment of hemorrhagic shock, and those who do not.
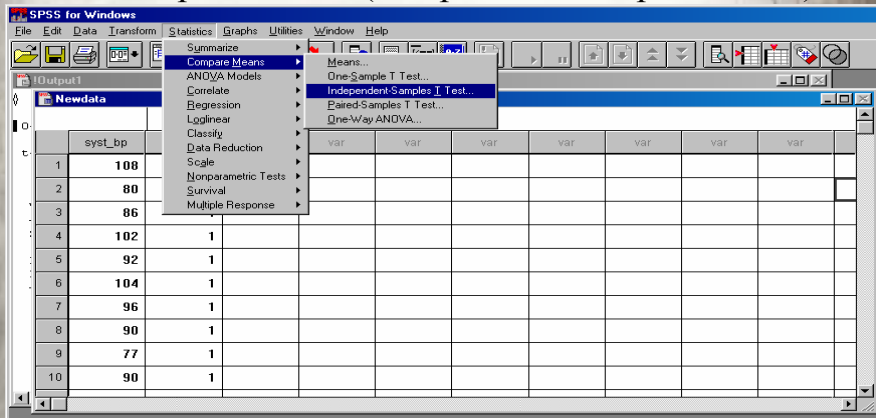

An Example Using SPSS continued

- **Select Alpha Level**
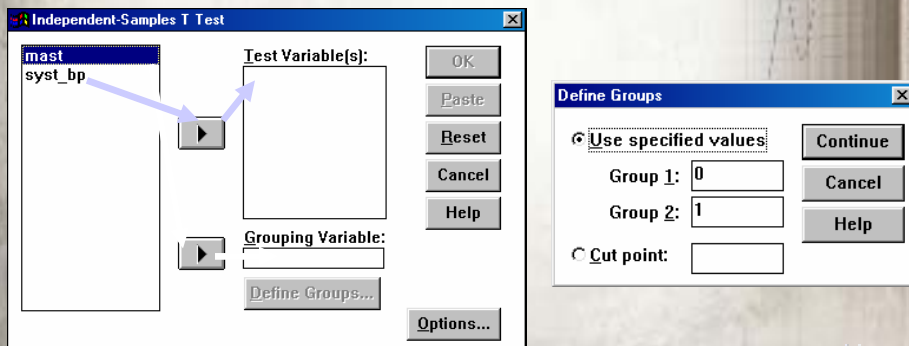
  - $\alpha = 0.05$

An Example Using SPSS continued

- **Test statistic**
  - Unpaired *t* test (Independent-Samples T Test)

An Example Using SPSS continued

- **Independent-Samples T Test continued**

An Example Using SPSS continued

- **P-value**

	Number of Cases	Mean	SD	SE of Mean
Variable				
SYST_BP				
MAST 0	200	72.4300	5.656	.400
MAST 1	200	92.1900	10.923	.772

Mean Difference = -19.7600

Levene's Test for Equality of Variances: F=125.832 P= .000

1

4

2

	t-test for Equality of Means				95%
Variances	t-value	df	2-Tail Sig	SE of Diff	CI for Diff
Equal	-22.72	398	.000	.870	(-21.470, -18.050)
Unequal	-22.72	298.57	.000	.870	(-21.472, -18.048)

3

An Example Using SPSS continued

- **Conclusion**

  - *P* is less than alpha, therefore we reject the null hypothesis: there is a difference between the experimental and control groups.