

## **Homework #5 (Hypothesis Testing)** **PSCI 2300 - Spring 2018 (Dr. Hensel)**

This homework assignment is due at the beginning of class (i.e., before lecture starts) on **Wednesday, April 25**. Any work turned in after lecture begins that day (even if only a few minutes into class) will be assessed a late penalty. Also, note that all work must be your own -- students found to have copied their answers from other students (or to have had their answers copied by other students) will receive automatic zero grades on this assignment, and may face further disciplinary action.

Please type your responses to each question. Be sure to show your work wherever relevant; correct answers that do not show their work will only receive half credit.

*This homework assignment requires you to analyze data on the 50 U.S. states compiled by the author of our textbook, which is available from the same portion of the class web site where you access the homework assignments. You will analyze this data using SPSS (or PSPP) statistical software. The last page of this homework assignment sheet provides instructions for using SPSS, and PSPP is usually very close to the same instructions and options.*

### Difference of Means Tests

1. Use SPSS (or PSPP) to run a difference of means test to determine whether or not there is a significant difference in gun restrictions between states that voted for and against President Obama in 2012. The independent variable is Obama\_win12 ("Did Obama win the state?") and the dependent variable is gun\_rank\_rev ("Higher score=more gun restrictions").

Be sure that your homework includes the full output from the T-test, including both the "Group Statistics" box (showing the mean, SD, and other summary information for each value of the independent variable) and the "Independent Samples Test" box (showing the results of the test).

2. What do the results from this test tell you about whether these states differ significantly? Refer to the significance of the t-test for Equality of Means, as well as the group statistics. What is the mean for each group, and what does this significance test tell us about the difference?

### Analysis of Variance (ANOVA)

3. Use SPSS (or PSPP) to run an analysis of variance (ANOVA) to determine whether or note there is a significant difference in gun restrictions between states in different geographic regions of the country. The independent variable is division ("Census division") and the dependent variable is gun\_rank\_rev ("Higher score=more gun restrictions").

Be sure that your homework includes the full output from the T-test, including both the "Descriptives" box (showing the mean, SD, and other summary information for each value of the independent variable) and the "ANOVA" box (showing the results of the test).

4. What do the results from this test tell you about whether these states differ significantly? Refer to the significance of the ANOVA, as well as the group statistics. What is the mean for each group, and what does this significance test tell us about the difference?

### Crosstabulation

5. (*worth 2 points*) The in-class survey has produced the following results for the question about the current amount of U.S. defense spending. Among male respondents, 18 believe that the U.S. spends too much on defense, and 27 do not; among female respondents, 27 believe that the U.S. spends too much on defense, and 16 do not.

Create a crosstabulation of these results, being sure to include all of the table elements that we talked about in class; each of these four elements is worth 1/2 point:

- (1) Setup: place the independent and dependent variables in the appropriate places
- (2) Cell frequencies in each cell
- (3) Column percentages in each cell
- (4) Marginals: all row/column marginals (including column percentages), as well as N

### Measuring Association: Phi

7. Use SPSS (or PSPP) to run a crosstabulation of the relationship between how religious a state is and whether or not the state voted for Obama. The independent variable is Religiosity ("Religiosity3") and the dependent variable is Obama\_win12 ("Did Obama win the state?"). You will need to include the statistics for Chi square, Phi, and Lambda, as well as both observed cell frequencies and column percentages.

Be sure that your homework includes the full output, including the basic crosstabulation as well as the "Chi-Square Tests" box (showing the  $X^2$  results), the "Directional Measures" box (including the results for Lambda), and the "Symmetric Measures" box (showing the results for Phi).

8. What do the results from the  $X^2$  (Chi-square) statistic tell you about the association between these variables?
9. What do the results from the Phi statistic tell you about the association between these variables?
10. What do the results from the Lambda statistic tell you about the association between these variables?

### **SPSS Instructions for This Assignment**

- For more detail about using SPSS, see my SPSS Guidelines and Instructions document that is posted on the class web site. At the time when this assignment was first posted, this SPSS Guidelines document does not include any instructions for using PSPP, although such instructions will be added when the instructor has time to investigate it more completely.

<<http://www.paulhensel.org/Teaching/spss.pdf>>

- Download the data set that you will need for this assignment (perhaps to a flash drive if you are not working on your own personal computer) -- *please note that this is the same data set used for homework #4, so if you still have that available, you do not need to do any additional work to reacquire it.* From a computer that has SPSS or PSPP, open this data file, using one of the following two options:
  - Double-click on the data set, which should automatically open SPSS and then open the data set in SPSS. [Note that this option does not appear to work in PSPP]
  - Open SPSS manually by clicking on the icon or on an alias/shortcut to it. Once it is open, select and open the data set using **File > Open** from the menu bar at the top of the screen.

### *Difference of Means*

- Go to **Analyze > Compare Means > Independent-Samples T Test**. This will open a dialog box that allows you to choose variables for analysis.
- Select the variable you want to examine (the dependent variable) on the left side of this box, push the arrow button toward the top of the screen, and the variable should then appear in the "Test Variable(s)" window at the right side of the box. Do the same to select the variable that you are using to identify groups for comparison (the independent variable), and push the button in the middle of the screen to select this for the "Grouping Variable" box. Then select the "Define Groups" button and list the two variables you want to compare (often group1=0 and group2=1), click Continue to return to the variable selection

screen, and click OK to run the analysis. (If you want to remove a variable from the list, select the variable in the right side of the box, and click the arrow in the middle of the screen.)

- Once the output appears in the Output Viewer window, be sure to print it out (or copy and paste it into a word processing document), because you will need to turn this in to get full credit for your assignment.

### *ANOVA*

- Go to **Analyze > Compare Means > One-Way ANOVA**. This will open a dialog box that allows you to choose variables for analysis.

- Select the variable you want to examine (the dependent variable) on the left side of this box, push the arrow button toward the top of the screen, and the variable should then appear in the "Dependent List" window at the right side of the box. Do the same to select the variable that you are using to identify groups for comparison (the independent variable), and push the button in the middle of the screen to select this for the "Factor" box. Click the "Options" box and be sure that "Descriptives" is checked, to make sure that you will get the means for each group; once this happens, click OK to run the analysis. (If you want to remove a variable from the list, select the variable in the right side of the box, and click the arrow in the middle of the screen.)

- Once the output appears in the Output Viewer window, be sure to print it out (or copy and paste it into a word processing document), because you will need to turn this in to get full credit for your assignment.

### *Crosstabulation and Chi-square*

- Go to **Analyze > Descriptive Statistics > Crosstabs**. This will open a dialog box that allows you to choose variables for analysis.

- Select the variable you want to examine (the dependent variable) on the left side of this box, push the arrow button toward the top of the screen, and the variable should then appear in the "Row(s)" window at the right side of the box. Do the same to select the variable that you are using to identify groups for comparison (the independent variable), and push the button in the middle of the screen to select this for the "Column(s)" box. Click the "Statistics" box and be sure that "Chi-square," "Phi and Cramer's V," and "Lambda" are all checked, to make sure that you will get the relevant statistics, then click Continue to return to the main variable selection screen. Click the "Cells" box and be sure that the "Observed" counts and "Column" percentages are selected, then click Continue to return to the main variable selection screen. Once everything is ready, click OK to run the analysis. (If you want to remove a variable from the list, select the variable in the right side of the box, and click the arrow in the middle of the screen.)

- Once the output appears in the Output Viewer window, be sure to print it out (or copy and paste it into a word processing document), because you will need to turn this in to get full credit for your assignment.