

**Homework #4 (Hypothesis Testing - Nominal/Ordinal Variables)**  
**PSCI 2300 - Fall 2019 (Dr. Hensel)**

This homework assignment is due at the beginning of class (i.e., before lecture starts) on **Monday, November 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.*

Crosstabs,  $X^2$ , and Phi

1. Come up with a theoretical story (2-3 sentences) to explain the relationship you would expect to see between a country's economic wealth (the independent variable) and its chances of being democratic (the dependent variable). (1/2 point)

What is the research hypothesis in your theoretical story ( $H_1$ ), and what is the appropriate null hypothesis ( $H_0$ )? (1/2 point)

2. Use SPSS (or PSPP) to run a crosstabulation of this hypothesized relationship, using "GDP per capita (US\$): 3 cats" (Gdp\_Cap3) as the independent variable) and "Is regime a democracy?" (Democ\_regime) as the dependent variable. You will need to include the statistics for Chi square, Phi/Cramer's V, and odds ratio, as well as both observed cell frequencies and column percentages.

Be sure that your homework includes the full output, showing all of the needed information, either within the main text of the homework answers or attached at the end.

3. What do the results from the  $X^2$  (Chi-square) statistic tell you about the independence/association of these variables? Be sure to address both the significance of the relationship, and the substantive meaning (which groups are more or less likely to show certain conditions or behaviors).

4. What do the column percentages in the table tell you about the direction of the association between these variables?

5. What do the results from the Phi statistic tell you about the strength of the association between these variables?

Scatterplots and Correlation

6. Come up with a theoretical story (2-3 sentences) to explain the relationship you would expect to see between a government's spending on health care and its spending on education.

What is the research hypothesis in your theoretical story ( $H_1$ ), and what is the appropriate null hypothesis ( $H_0$ )? (1/2 point)

7. Use SPSS (or PSPP) to run a scatterplot of this hypothesized relationship, using "Public expenditure on

education as a percentage of GDP (UN)" (SpendEduc) and "Public expenditure on health as a percentage of GDP (UN)" (SpendHealth) as the two variables.

Be sure that your homework includes the full output, either within the main text of the homework answers or attached at the end.

8. What does the scatterplot suggest about the shape, direction, and strength of the relationship between these two variables?

9. Use SPSS (or PSPP) to run a correlation of this hypothesized relationship, using "Public expenditure on education as a percentage of GDP (UN)" (SpendEduc) and "Public expenditure on health as a percentage of GDP (UN)" (SpendHealth) as the two variables. If you are using SPSS, be sure that the "Pearson" option is checked in the "Correlation Coefficients" box; this is automatically included if you are using PSPP.

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10. What does the correlation coefficient suggest about the significance, direction, and strength of the relationship between these two variables?

### SPSS Instructions for This Assignment

- For more detail about using SPSS or PSPP, including links to online resources that give more details on how to use these methods in SPSS and interpret their results, see my SPSS Guide document that is posted on the class web site.

<<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 NOT the same data set used for homeworks #2 and #3* 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.

### Crosstabulation, $X^2$ , and Phi

- 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) from the list 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 "Risk" are all checked (in PSPP these are "Chisq," "Phi," and "Risk"), 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 ("Count in PSPP) 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.

### *Scatterplots and Correlation*

- In SPSS: go to **Graphs > Legacy Dialogs > Scatter/Dot**. From the choice of plot types, select **Simple Scatter** (for a basic scatterplot), then click the **Define** button. Select the variable you want to examine (the dependent variable) from the list on the left side of this box, push the arrow button next to the Y Axis box, and the variable should then be selected as the dependent variable for your analysis. Do the same to select the independent variable for the X Axis box. (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.) Click OK to run the analysis.

--In PSPP: go to **Graphs > Scatterplot**. Select the variable you want to examine (the dependent variable) from the list on the left side of this box, push the arrow button next to the Y Axis box, and the variable should then be selected as the dependent variable for your analysis. Do the same to select the independent variable for the X Axis box. (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.) Click OK to run the analysis.

- 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.

### *Correlation*

- In SPSS: go to **Analyze > Correlate > Bivariate**. One at a time (don't worry about the order - independent and dependent variables don't matter for correlation), select each variable that you want to examine from the list on the left side of this box, and push the arrow button to add it to the Variables box. (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.) Make sure the Pearson box is checked under Correlation Coefficients, and click OK to run the analysis.

--In PSPP: go to **Analyze > Bivariate Correlation**. One at a time (don't worry about the order - independent and dependent variables don't matter for correlation), select each variable that you want to examine from the list on the left side of this box, and push the arrow button to add it to the Variables box. (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.) Click OK to run the analysis (unlike SPSS, Pearson's correlation coefficient is the only technique offered by PSPP, so you don't need to select it).

- 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.