

### **3. *Causality, Statistical Significance, and Substantive Significance***

#### **SUGGESTED COURSE EXTENSIONS**

##### **A. Reviewing**

1. In a journal article in your field, find an example of a highly correlated association.
  - a. Is that association causal? Why or why not?
  - b. List facts or comparisons that could be used to evaluate the substantive meaning of the association:
    - i. that the authors report and interpret in the article;
    - ii. other facts or comparisons that could be used to improve the explanation in the article.
  
2. In a journal article in your field, find an association with a low correlation or nonstatistically significant association.
  - a. Is that association causal? Why or why not?
  - b. List facts or comparisons that could be used to evaluate whether the association is substantively meaningful:
    - i. that the authors report and interpret in the article;
    - ii. other facts or comparisons that could be used to improve the explanation in the article.
  
3. Find a journal article that uses multivariate regression to analyze a policy problem and proposes one or more solutions to that problem.
  - a. Evaluate how well the article addresses each of these aspects of “importance.” Does the article
    - i. specify a cause-and-effect type of relationship?
    - ii. provide a plausible argument for a causal association?
    - iii. discuss bias, confounding, or reverse causation?
    - iv. report results of statistical tests for that association?
    - v. assess whether the expected benefits of the proposed solution are big enough to outweigh costs or otherwise matter in a larger social context?
  - b. Given your answers to part a, write a short critique of the appropriateness of the proposed solution.

4. Repeat question A.3 with an article in the popular press about a scientific or policy problem and solution that is currently being touted for implementation.

### **B. Writing and Revising**

1. Identify an aspect of your research question that involves the association between an independent and dependent variable. Do you hypothesize that that association is causal?
  - a. If so, describe the mechanisms through which the hypothesized causal variable affects the hypothesized outcome variable.
  - b. If not, explain how those variables could be correlated. Identify possible bias, confounding factors, or reverse causation.
  - c. Rewrite your research question as a hypothesis, making it clear whether the association you are studying is expected to be causal.
  - d. What background facts could help assess the substantive meaning of that association? Look them up and write a short description to make that assessment.
  - e. Write a description of the substantive importance of the association for a discussion section of a scientific paper.
  - f. Write a statement for a lay audience, explaining the nature of the association between the variables.
  
2. For one or two key statistical results pertaining to the main research question in your paper, identify ways to quantify the broad social or scientific impact of that finding, following the guidelines in chapter 3 of *Writing about Multivariate Analysis, 2nd Edition*.
  - a. Locate statistics on the prevalence of the phenomenon you are studying.
  - b. Find information on the consequences of the issue. For example, what will it cost in money, time, or other resources? What are its benefits? What does it translate into in terms of reduced side effects, improved skills, or other dimensions suited to your topic?
  - c. Use information from parts a and b in conjunction with measures of effect size and statistical significance to make a compelling case for or against the importance of the topic.
  
3. Repeat question B.2 for a paper you have already written about an application of a multivariate regression model.