Sociology 750 – Freese – Spring 2004
Exercise #5: Causal Inference in Observational Studies
Weight: 2 points

Due date and time: March 25, 11:59pm (note policy on the syllabus about late exercises). Turn in via e-mail with Completed Exercise 5 as subject line and answers given in body of e-mail (not as attachment)

Purpose: An occasion for you to reinforce your understanding of some more advanced topics in quantitative causal inference covered in lecture (and readings) the last couple weeks.

Your exercise should contain four parts, with appropriate enumerations separating each part.

Tasks:

1. Several times so far this semester, I have put up drawings that have arrows running from $X$ to $Y$ and from $Z$ to both $X$ and $Y$. I have talked about the unadjusted estimate of the “treatment effect” of $X$ on $Y$, and then I have talked about the adjusted estimate of the treatment effect controlling for $Z$. In mathematical or verbally mathematical terms (e.g., “the product of...” or “… divided by ...”), what determines the magnitude of the difference between the unadjusted and adjusted estimates of effects? (two sentences maximum)

2. In its advertising, the Acme Test Prep program presents data on the change in the GRE test performance of its customers. That is, for all customers who had taken the GRE before enrolling in Acme (and then take the GRE after they’ve finished), Acme computes the difference in scores between the “before” test and “after” test. These results invariably show that the average customer does better on the “after” test than they did on the “before” test. Assume that the data presented in the ads is completely honest. Explain how these results might be influenced by dynamics that we considered in class during our discussion of “regression to the mean.” (three sentences maximum)

3. For some substantive issue you are interested in that cannot be adequately studied using experiments,¹ describe an imagined (but not unrealistic) “natural experiment” that would allow a researcher better insight into a causal “effect” or “consequence” or “process” that would not otherwise be available. What assumptions underlying your consideration of the scenario as a “natural experiment”? Be specific about a/the causal question that the scenario allows one a special opportunity to consider. (six sentences maximum)

¹ That is, the majority of substantive issues of interest to sociologists.
4. For some substantive issue you are interested in, described an imagined scenario in which one would be able to make inferences using either the instrumental variable approach or the regression discontinuity approach described in class. Your description of this scenario should make clear that you understand the basic intuition of the approach, the potential leverage it provides in making causal inferences, and at least some key assumptions that applications of the approach imply. Good scenarios that are not simple transformations of the examples cited in class are an especially convincing and laudable way of demonstrating one's understanding here. (six sentences maximum)