DEPARTMENT OF POLITICAL SCIENCE
AND
INTERNATIONAL RELATIONS
Research Methods Posc 302

EXPERIMENTAL DESIGN

I. TODAY'S SESSION:
- A. Experimentation in social research
  1. Causal inferences
  2. Randomized experiments
  3. Measurement and interpretation and inference
- B. Test yourself

II. PROBLEM:
- A. For the moment let's move away from turnout and politics and consider this quotation from the Attorney General's "Final Report" on pornography:
  1. "In both statistical and experimental settings exposure to sexually violent materials has indicated an increase in the likelihood of aggression."
- B. In this same vein here's another quote I ran across:
  1. "Research conducted by Dr. William Marshall of Queens University shows 86 per cent of rapists are interested in hardcore pornography, and that even non-violent pornography can play a significant role in triggering sexually deviant behaviour."
     - i. Cited on the "Media Awareness Network" at http://www.media-awareness.ca/eng/issues/STATS/issvio
     - ii. What is being asserted is that "exposure" to "sexually violent" movies and magazines is not only associated with aggression but a **cause** of it.
     - iii. Note the word "triggering."
     - iv. Consequently, **if it is true**, government (or communities) might be justified in controlling or regulating television content.
       1) An aside: yesterday (September 21) I saw the premiere of "Dharma and Greg," a popular situation comedy. If one accepts the Attorney General's report as evidence, one could claim that its suggestive and even over sex content would have a negative influence on behavior.
- C. If we are going to take such a drastic step, we ought to first be convinced that televised violence and sex has deleterious consequences.
  1. The question then becomes what evidence does one need to accept claims of this sort?
  2. Would, for example, the following data presented in a cross-classification provide adequate justification for us to begin regulating television?

i. The table shows the relationship between amount of sexually explicit material seen by a sample of N = 360 men and their self-reported fantasies.
ii. By the way, how would you describe the relationship, strong or weak? Why?

	Exposure to Video Pornography					
Aggressive fantasies	**Percent (Frequencies)**	**Never**	**Once a month**	**Once a week**	**Twice a week or more**	**Totals**
	Yes	25% (50)	35% (35)	40% (12)	60% (18)	115
	No	75 (150)	65 (65)	60 (18)	40 (12)	245
	Totals	100% (200)	100% (100)	100% (30)	100% (30)	360

III. MAKING CAUSAL INFERENCES:

A. Although the subject of causal inference has long and involved history and philosophers of science are not totally in agreement, many social scientists feel the following evidence is necessary to support a causal attribution or inference.

1. **Constant conjunction**:
   i. Causal factor must "appear" with or be followed by its supposed effect.
   ii. Values of X are associated with or connected to values of Y.
2. **Temporal order**: X, the causal factor must come before Y, the effect.
   i. An effect cannot be its cause.
3. **Elimination of alternative hypotheses** or explanations
   i. That is, even though we believe or know that X precedes Y and that whenever X occurs, so too does Y, there is still room for doubt about causality.

B. Eliminating alternative explanations:

1. Refer back to the example discussed in Class 5 regarding stork populations

and birth rates.

i. We observed a relationship between storks and births.

ii. How do we explain the connection? A couple of possibilities come t mind, as shown in the next figure.

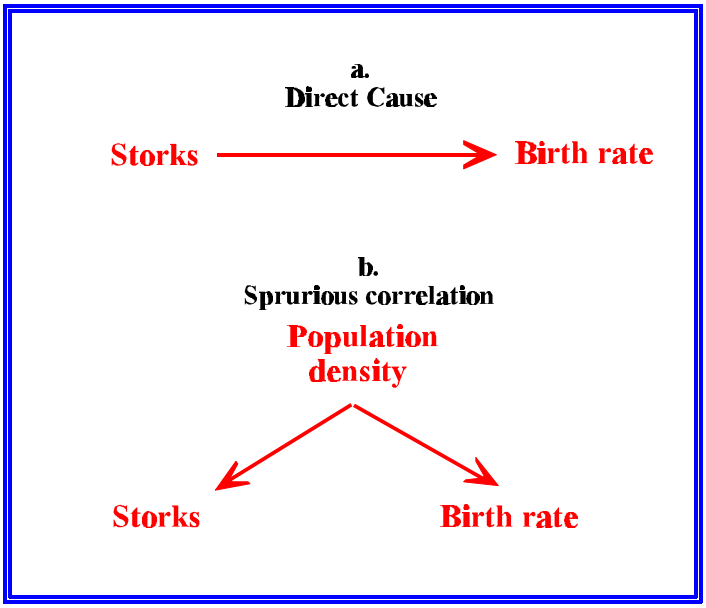

Figure 1: Cause Versus Spurious Association

2. It's possible that storks are directly linked to births, that they are a direct cause, or at least part of a causal chain.
   i. See Figure 1-a.
3. On the other hand the relationship may be "spurious."(Figure 1-b)
   i. What does spurious mean? Look it up.
   ii. What may be happening, in other words, is that there is an additional factor or variable that is related to both births and stork population size in such a fashion as to create the appearance of a relationship between the two variables.
   iii. Once we "control" for or eliminate this "alternative" explanation the relationship will disappear.
   iv. In this instance we might note the following: rural areas are places with **both** high birth rates and large numbers of storks (because they can easily find nesting places). Similarly more urbanized or congested areas have lower birth rates **and** coincidentally lower stork nesting sites.

1) If so, we would observe a relationship between births and storks but it would be a pseudo or false or spurious one.
2) There would be no real causal connection between the two.
3) If we looked at only urban areas, for instance, we might find that there is no connection between the number of storks and births per 1,000 women aged 16 and older.

C. By the same token, if we were going to outlawed televised violence and sex because we found an association between men's viewing habits and their aggressive tendencies, we would need to be certain (as possible) that the connection was spurious.

1. The next figure suggests a possible explanation for the data in the table.

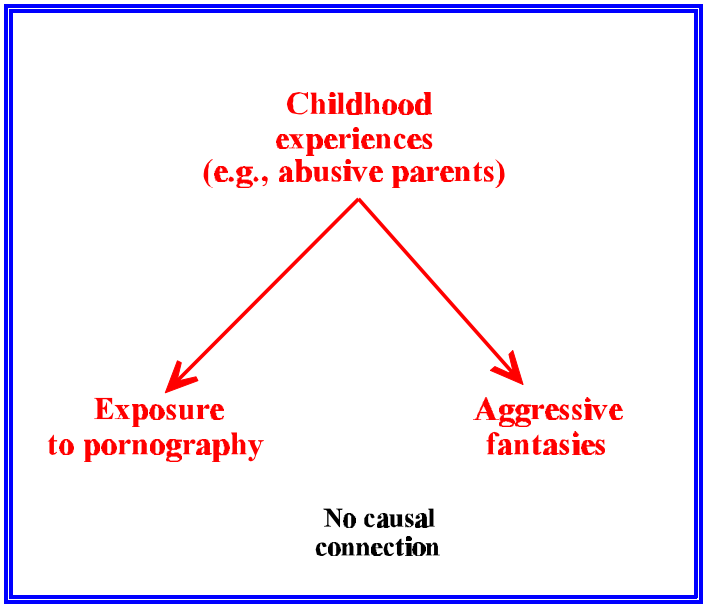

Figure 2: Spurious Relationship

i. That is, one might argue that men who have certain childhood experiences watch pornography **and coincidentally** have aggressive thoughts about women.
ii. But these thoughts are not produced by televised violence and sex. In fact they would occur even in the absence of this kind of media exposure.

D. The upshot is that we have to eliminate alternative explanations for apparent relationships before we can confidently claim one thing causes another.

IV. THE RANDOMIZED EXPERIMENT:

A. An experiment involves the investigator's explicit manipulation of the

experimental factor or variable or treatment.

1. One can then determine with some certainty time order because the supposed or hypothetical causal factor can be controlled.
2. But just because the analyst controls the appearance of the test factor still more is needed.
3. After all we have to be able to eliminate alternative explanations.
   i. We must be in a position to rule family background or childhood experiences as explanations.
      1) See Figure 2.

B. Think about this: we could select a sample of men and assign them to an experimental group.

1. As members they would be "exposed" to the hypothesized causal factor, say video pornography.
   i. We want to see what happens to them after subjecting them to several hours of pornographic videotapes.
   ii. We could diagram the situation as follows.

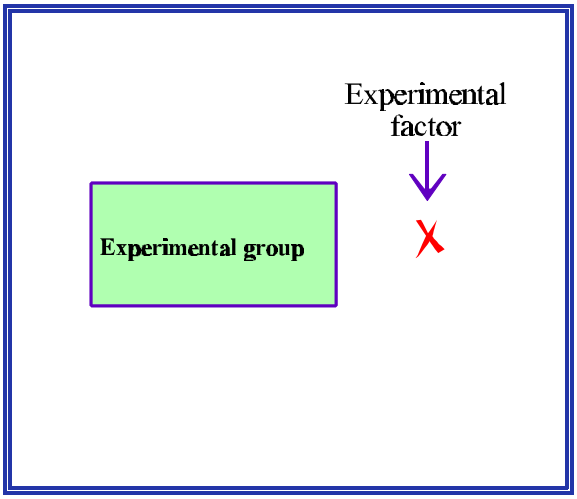

Figure 3: Experimental Group No Control

2. But a moment's thought will show that this won't work.
   i. Why? We need to compare those "exposed' with those who are not.
   ii. Even if we measure behavior, attitudes, and dispositions before and after the experiment and note changes, we can't attribute any changes to the experimental factor.
   iii. After all the men might have changed anyway. Or a similar group of

men not so exposed might have also changed in exactly the same way.

iv. So we need to compare a group of men of who have watched pornography with a group that has not.

C. Simple experimental design

1. So let's add a "control" group: subjects who are selected at the same time as those men going into the experimental group.
2. An example:

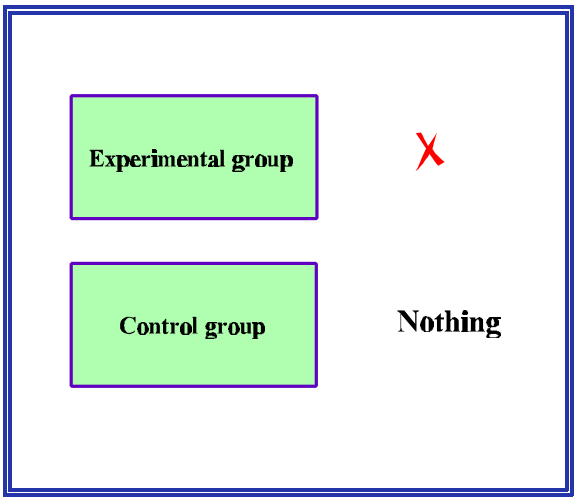

Figure 4: Experimental and Control Group

3. One might think that we could take post-test measures and compare the experimental with the control group to see if the factor made a difference.
   i. Example: Average aggression score among the experimental subjects should be higher than among the control group.
      1) In symbols, $Y_{experiment} > Y_{control}$, where Y is the **average** aggression score.
4. But even this won't work.

D. There's a problem with simply comparing one group with another in terms of the effects of an experimental variable, however.

1. **Before comparing the post-experiment scores of the two groups we must make sure that they "started out the same."**
   i. That is, we need to be certain that the average pre-experiment score of the experimental group is about the same as the average pre-experiment score of the control group.

ii. In symbols:

$$\bar{Y}_{experiment} \approx \bar{Y}_{control}$$

1) where $\bar{Y}$ means "the average score" on, in this case, aggression and the symbol "≈" means "approximately equal."
2) We'll discuss "approximately" later.

2. Why this requirement?
   i. Because if the groups start out unequally it might be hard to tell if or how much the experimental variable added to the difference.

E. But even this not enough: we need to make sure that at the outset of the experiment both groups are about the same in **all** possible respects.

1. That is, if we have group 1 (the experimental) and group 2 (the control), we have to be sure both groups of men are on average about the same age, same income, same education, same physique, same level of intelligence, same political ideology, same health, same hair color, same...
2. The groups have to be approximately homogenous at the start of the experiment or before the manipulation.
   i. Why? Because if we later observe an average difference between them we will be able to attribute it to the experimental variable and only the experimental variable or factor.
   ii. That is, at the outset we need (in symbols)

$$A_{experiment}, B_{experiment}, C_{experiment} \ldots, \approx A_{control}, B_{control}, C_{control}, \ldots,$$

.

1) These symbols just mean that the averages of the experimental group are nearly equal to the averages of the control group.
2) This is just a fancy way of saying that at the outset of the study we should have two similar groups and **then** subject one to the experimental variable.

V. RANDOMIZATION:

A. Randomization:

1. **Randomly** assign individual to either the experimental or control group.
   i. Roughly speaking random assignment means that a subject, A, as much chance being assigned to group E as to group C.

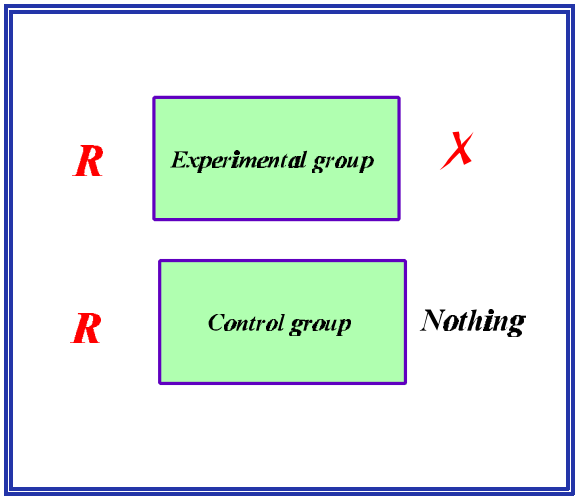

Figure 5: Random Assignment

2. Random assignment (one hopes) ensures that both groups are initially homogeneous.

B. Since they are homogeneous with respect to all possible causal factors, then causal inference is (in theory) possible:

1. If a group difference is detected after the experiment, this difference can be attributed to the experimental factor or variable.

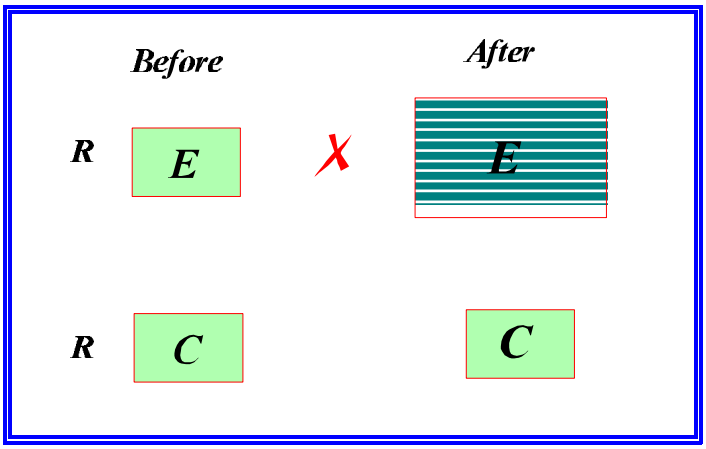

Figure 6: Effects of Randomization

2. The figure (Figure 6) is meant to show that the groups are the same before the experiment and that if they differ afterwards, the difference can be attributed only to the presence of the introduction or manipulation of the experimental factor.

C. It is randomization that gives controlled experiments their "power" to detect causality.
   1. By randomly assigning individuals to groups the experimenter effectively "controls for" all factors that could cause differences.
   2. Unless one has made randomized assignment making causal inferences is somewhat difficult.

D. Note randomization has nothing to do with random samples.
   1. Many psychology experiments, for instance, use non-randomly sampled undergraduates in experiments. But they are usually randomly assigned in some fashion to experimental and control groups.

VI. NON-EXPERIMENTAL RESEARCH:

A. Suppose we conduct a poll and compare Protestants, Catholics, and Jews' attitudes toward capital punishment.
   1. Suppose further we find that differences between them.
   2. Can we assume that religion "causes" these differences in opinions? No, because the groups in our study might differ in other ways besides religion, such as income, education, political ideology, or place of residence. It might be on of these factors, not religion per se, that "causes" people to have the attitudes that they do.

B. Similarly, suppose we compare states with and without the death penalty and suppose further that we find the violent crime rate is lower in the former than the latter.
   1. Does this result indicate that the "presence and application" of capital punishment causes a reduction in violent crime?
   2. Not necessarily, because the two groups of states might differ in other respects such as number of males less than 25 and these differences might account for the variation in crime.

C. Finally suppose we have a situation such as the one illustrated in Figure 7.
   1. It shows hypothetical data of the sort politicians love to use to prove how effective they are.
   2. It might seem that the number of people receiving welfare benefits declined **because** President Clinton took office and steered a welfare reform package through Congress.
   3. But the problem is that lots of other things were going on as well, such as a rapidly expanding economy.

i. Perhaps it was one of those things, not the Clinton administration, that explains the decline in welfare recipients.

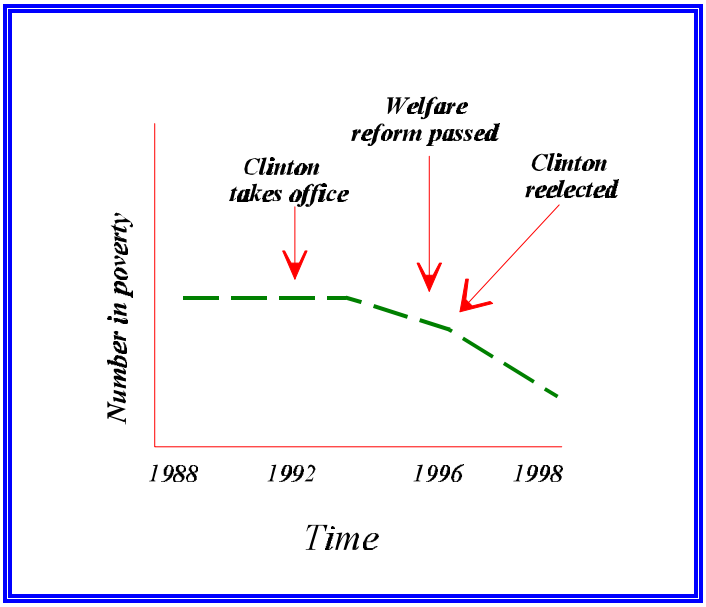

Figure 7: Quasi-experiment

VII. TEST YOURSELF:

A. Make sure that you can fill in the blanks or missing information.

Opinion/Region	Northerners	New Englanders	Westerners
More gun control	???	???	5.0
Same	65.0	8.0	???
Less gun control	5.0	10.0	80.0
Totals	100.0	100.0	100.0

i. The numbers in the table are percentages. You should be able to fill

in “the blanks” with just a moment’s thought.

VIII. NEXT TIME:

A. Approximations to experiments

1. Quasi or naturalistic experiments.
2. How survey data can be “manipulated” to permit causal inferences in non-experimental settings.

B. Reading:

1. Johnson and Joslyn, ***Research Methods***, Chapter 5.