DEPARTMENT OF POLITICAL SCIENCE
AND
INTERNATIONAL RELATIONS
Research Methods Posc 302

NON-EXPERIMENTAL DESIGNS

I. TODAY'S SESSION:
- A. Summary of experiments
- B. Non-experiments
- C. More test yourself

II. RECAP:
- A. Problem:
  1. Does exposure to pornography cause aggression?
     - i. Note: we have skipped or only alluded to measurement problems.
- B. Operational hypothesis:
  1. Exposure to 10 hours of violent pornography will raise aggression scores.
     - i. Two versions:
       - 1) "After" (Posttest) scores will be higher than "before" (pretest) scores.
       - 2) Experimental group scores will be higher than control group.
- C. Procedure:
  1. Obtain N subjects (men)
  2. Randomly assign to control and experimental groups.
  3. Pretest measures of aggression index and other variables (family background, social status, etc.)
     - i. Note that we expect:

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

       - 1) Where $\bar{Y}$ is a symbol meaning " average aggression score."
     - ii. More over we expect for all measured independent variables (X) such as income, years of education that

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

1) Where again $\bar{X}$ represents a mean.

iii. In short, members of the experimental and control groups "start" off the same so if we later observe a difference it can be attributed to the experimental factor.

4. Conduct experiment:

i. Subjects watch videos in similar (one hopes identical) circumstances.

5. Posttest measurements

D. Analysis:

1. The main hypotheses accepted if::

$$\bar{Y}^{post}_{expermiment} > \bar{Y}^{post}_{control}$$

i. That is, if the **average** (posttest) aggression score of experimental group members is higher than the corresponding score for the control group, one can conclude that in **this** situation (see below) the "treatment factor" (violent pornographic videos) had an effect.

1) Note: we are looking for an average effect.

2) Our interpretation is of the "on the whole" sort.

2. Conversely if

$$\bar{Y}^{post}_{expermiment} \leq \bar{Y}^{post}_{control}$$

i. we reject the research hypothesis because the means do not differ or they differ in the wrong way.

1) For future reference, a statistical hypothesis of this sort is called "one-tailed."

ii. Note Johnson and Joslyn (page 120) suggest that the proper measure of effect is (where the symbol Δ means "experimental effect":

$$\Delta = \left(\bar{Y}^{post}_{expermient} - \bar{Y}^{pre}_{expermient}\right) - \left(\bar{Y}^{post}_{control} - \bar{Y}^{pre}_{control}\right)$$

3. We would also expect to find

$$\bar{Y}^{pre}_{expermiment} > \bar{Y}^{post}_{experimental}$$

i. And

$$\bar{Y}^{pre}_{control} \approx \bar{Y}^{post}_{control}$$

4. In other words, if the experimental variable is "working," we might expect to see a change among the experimental group members but not among those in the control group.
   i. This latter set of hypotheses is, however, secondary to the first regarding differences between the groups after the experiment has taken place.

E. Interpretation and recommendations

III. INTERPRETATION:

A. Note first that we can "picture" the experimental results in a table.

1. Doing so shows the relationship between the "treatment" X and the response Y.

Experimental Group	Control Group
Y_{1E}	Y_{1C}
Y_{2E}	Y_{2C}
Y_{3E}	Y_{3C}
Y_{4E}	Y_{4C}
... Y_{iE} ...	... Y_{iC} ...
$\bar{Y}^{post}_{experiment}$	$\bar{Y}^{post}_{control}$

2. This table shows that there are two variables under consideration, the experimental factor or independent variable, exposure (yes, no) and the dependent variable, aggression score.
3. In this layout we have all of the individual scores, presumably measured on some scale, and the average scores for each group.
   i. Think of the averages as corresponding roughly to the percentages in a cross-classification or contingency table.
4. A simpler picture would be one in which the individual scores are eliminated:

Experimental Group	Control Group
$\bar{Y}^{post}_{experimentl}$	$\bar{Y}^{post}_{control}$

B. Relationship:
1. If the experimental (treatment or independent) variable (X) is related to the response (dependent) variable, we would expect to see a difference between the means.
2. Suppose the aggression score can run from 0 ("no aggressive feelings") to 100 ("extremely aggressive feelings"). Then these hypothetical results would illustrate a **strong relationship**:

Experimental Group	Control Group
75.9	33.6

.

   i. The average score those who viewed the videos is more than twice that of the control group members.
      1) Note that these are **averages**, not percentages.

3. On the other hand, suppose the results had been:

Experimental Group	Control Group
51.9	49.8

i. The average scores are about the same so there is little or no relationship.

C. But just having these data is not enough. We have to be sure that the groups of men differed **only** with respect to the experimental factor.
1. Randomization (we hope) ensure that this is the case.
2. Consequently the relationship together with the randomization procedure suggests a causal inference is warranted.

D. How **valid** would a conclusion of this sort be?
1. Internal validity: the observed difference (between control and experimental) group can be attributed to the experimental manipulation and nothing else.
2. External validity: the observed difference can be assumed to hold in the "real world."
   i. The observed differences can be generalized to a larger "population" and/or conditions.
3. A sweeping generalization:
   i. Randomized experiments have high internal validity.
   ii. Their external validity is weak.

E. Why experiments go awry (see Johnson and Joslyn).
1. Experimenter and subject "biases."
2. Instrumental (testing) effects.
3. Characteristics of the experimental procedures (demand characteristics)
4. "Maturation"

IV. NON-EXPERIMENTAL RESEARCH:

A. Comparisons
1. Suppose we compare states with and without the death penalty.
   i. We are interested in Y, violent crime rates.
   ii. Such a comparison might be diagramed as in Class 6:

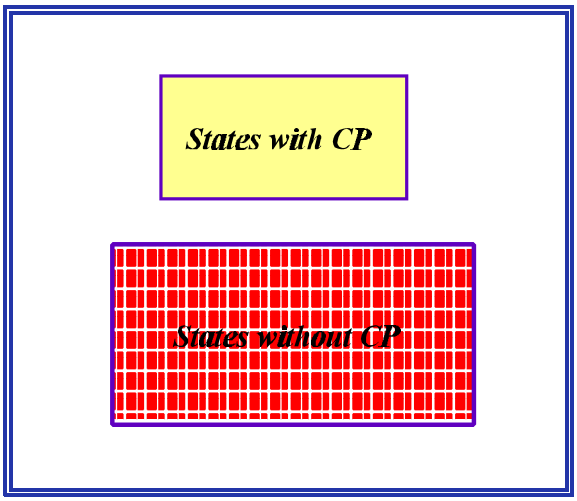

Figure 1: Comparison

iii. The figure is meant to show that states without the death penalty have higher violent crime rates than states with it.
   1) We could have illustrated the point with the sort of table presented earlier. Recall that it contained averages.

iv. Anyway, we aren't justified in making a causal attribution without more assumptions and data.
   1) In all likelihood the two "kinds" of states differ with respect to lots of factors (variables) other than capital punishment, and who is to say one or more of them doesn't explain the difference.

2. Comparison is an essential tool in any science. But it is only a part of the process of making inferences.

B. Time series and naturalistic experiments.

1. Policy analysts commonly confront the kind of problem presented in the next figure (Figure 2).

i. We saw an example last time (Class 6) when discussing the effects of welfare reforms.

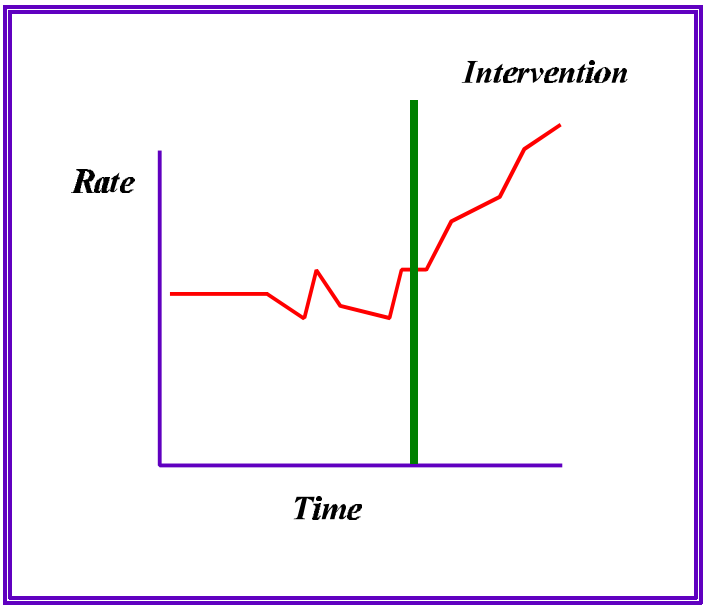

Figure 2: Intervention

ii. This is a "generic" figure: the rate could refer to anything such as crimes per 100,000 population or out-of-wedlock births or unemployment and time could be year, decade, or month.

2. The data are often called a "time series" because the information is collected for different periods of time.
   i. The zigzag line shows the "trend" in the rate: before the "intervention" the rate did not seem to increase or decrease systematically. The trend was constant. Afterwards, however, there seems to be dramatic increase in the rate that has been sustained for some time after the intervention..
3. The intervention bar represents an event such as the passage of a law.
   1) In the context we've been discussing the bar could represent the Supreme Court's early 1970 decision ruling capital punishment unconstitutional and the rate the number of homicides committed per year per 100,000 population.
   2) Or the "intervention" could be X-rated movies come on the scene (e.g., "Deep Throat" 1972).
4. We might then think of the intervention is a naturalistic "before-and-after" experiment.
   i. A process is occurring and then is disturbed by an event or intervention.
   ii. Of course, the intervention is not "manipulated" like an experiment.
5. A possible interpretation might be: "the policy had an effect."
   i. The Court's ruling caused crime to increase or sex in the media

have caused...

6. Once again, we can only guess as to causal efficacy.
   i. Besides the intervention other factors–many of them unmeasured or even unknown-- may be at work and perhaps it's one or more of them that causes a change in the trend.

C. Surveys
   1. Now, let's conduct a survey or public opinion poll about the effects of pornography.
      i. We'll take a sample of 100 men ages 18 to 50.
      ii. We can ask them about their interests and in particular how often they view X-rated movies with violence.
      iii. In addition we might administer a short questionnaire that supposedly measures the amount of aggression they feel toward women.
      iv. These data can be presented in a cross-tabulation much like the ones we've seen before.

Aggression/X-rated viewing	None or once a year	More than one a year	Totals
Low	66.7% (40)	25.0% (10)	50
High	33.3 (20)	75.0% (30)	50
Totals	100.0% (60)	100.0% (40)	100

      v. This looks like a strong relationship. But supposed our survey also asked about family background and in particular whether or not the family was "intact" during adolescence.

vi. Suppose these are the results.

Aggression/Family life	Intact	Broken	Totals
Low	70.0% (42)	27.5% (11)	50
High	30.0 (18)	72.5% (29)	50
Totals	100.0% (60)	100.0% (40)	100

vii. Here we find a relationship that it just as strong; that is family background is related to aggressive feelings.

viii. If it turns out that background is **also** related to the number of X-rated movies a man watches we might have a spurious relationship of the sort mentioned last week (Class 6).

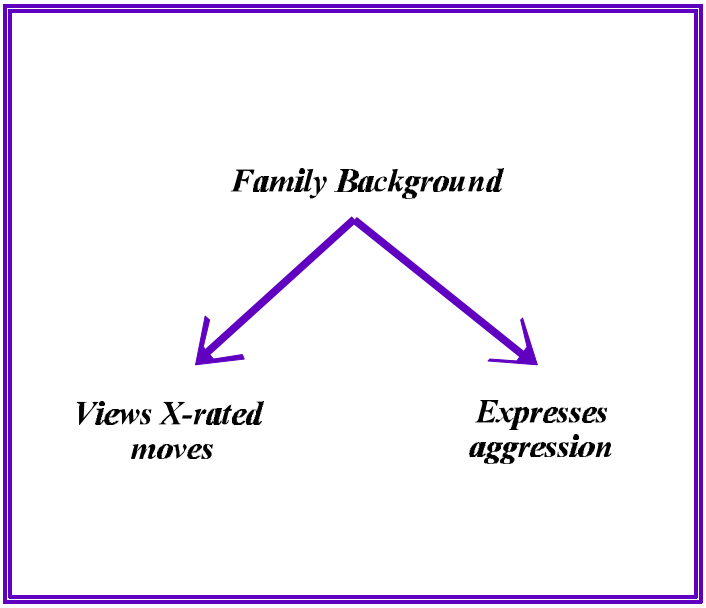

Figure 3: Spurious, Non-causal, Relationship

2. Determining whether a connection between media exposure and aggression exists and whether or not it is causal it not easy with survey data.

V. CAUSAL INFERENCES IN NON-EXPERIMENTAL RESEARCH:

A. What is left for us?

B. It is sometimes possible to manipulate data statistically in order to lend slightly more credence to a causal assertion.

C. Example:

1. We'll stick for the moment with the media-aggression problem.
2. Suppose we find, as in the previous example, that men who see a lot of video violence against women tend to harbor aggressive feelings toward them.
   i. We've established the covariation or constant conjunction mentioned in Class 5 and Class 6.
3. Suppose also we're prepared to believe or assume that men grow up with television and that thus there feelings toward women, which take years to develop, come "after" this exposure.
   i. Hence we believe we've established causal precedence or time order.
   ii. This assumption is almost always going to be a problem and places severe limits on social science research.
4. Now, what about third factors or alternative explanations.
   i. We haven't assigned men at random to their television viewing habits.

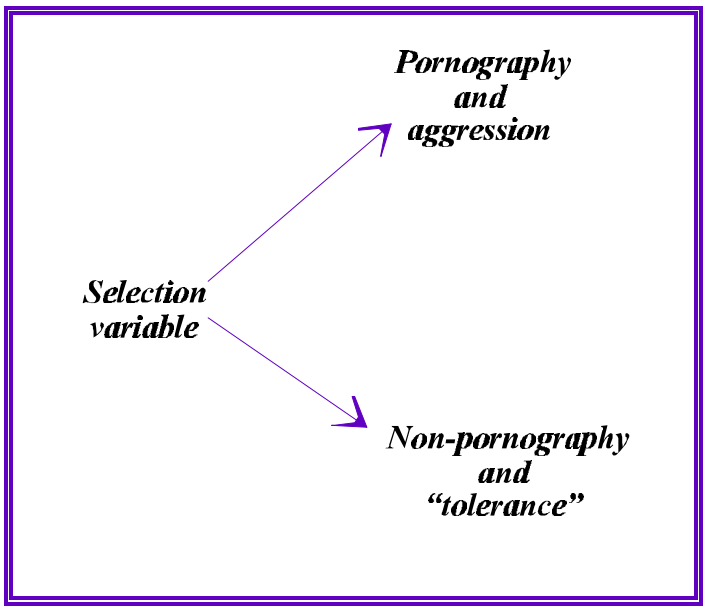

Figure 4: A Selection Variable

ii. Consequently, we don't know if those who are attracted to violent pornography are representative of men in general or are "self-selected," the self-selection being based on another factor such as family background.

iii. If we can identify and measure such a factor or selection variable, we can then "adjust" or compensate for it in our analysis.

D. Here's one way:

1. Divided survey respondents into categories according to their position or value on the selection variable.
   i. Example: classify men in the survey as "stable family history" and "history of child abuse."
2. Then look at the relationship between media exposure and attitudes **within each category** of the selection variable.
   i. See the Figure on the next page.
   ii. In effect we construct a series of contingency or cross-classification tables, one for each category of a selection or control variable.
   iii. We then examine the relationship between X and Y within each.
   iv. We'll see how to do this next time.

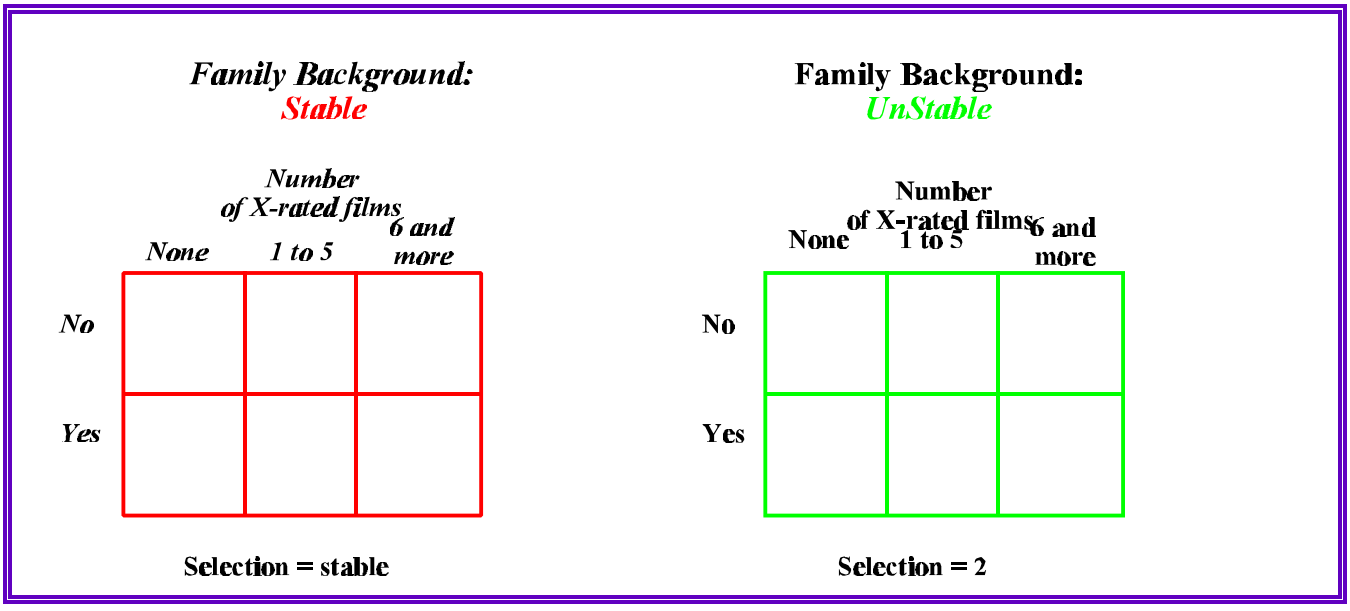

Figure 5: Control By Selection Variable

VI. TEST YOURSELF:

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

Opinion/Region	Northerners	New Englanders	Westerners
More gun control	20	45	15
Same	45	28	23
Less gun control	20	10	80
Totals			

i. The numbers in the table are frequencies. You should be able to calculate the percentages **and** row and column marginal totals.
ii. How many total cases are in this table?
iii. Would you say that there is a relationship between region (X) and attitudes toward gun control? Explain.

VII. NEXT TIME:

A. Survey research
1. We start analyzing survey data by creating simple cross-tabulations.
2. Multi-way tables

B. Reading:
1. Johnson and Joslyn, ***Research Methods***, Chapter 5 contains a discussion of many of the terms introduced in the last couple of classes.
i. See especially pages 114 to 118
2. Look ahead to Chapter 12, pages 325 to 336.