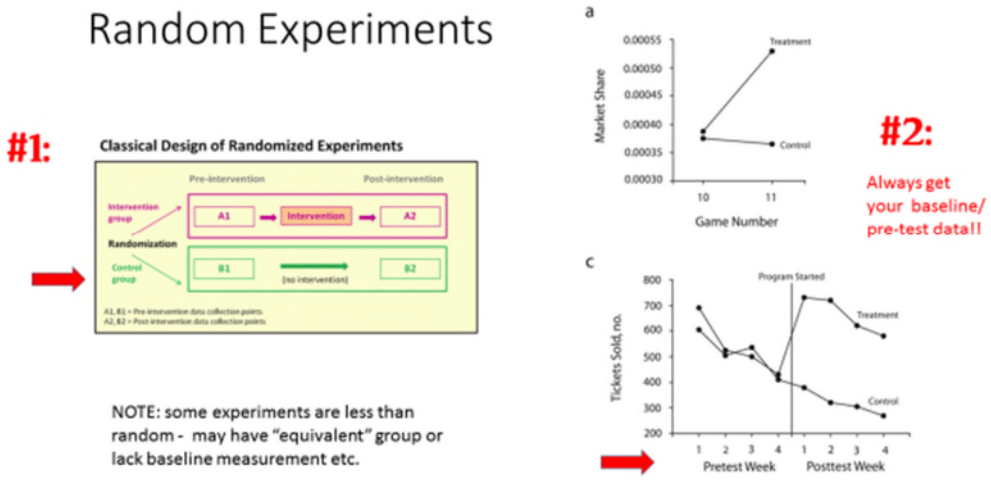
Chapter 2: Research Design

Note: SI refers to the section introduction on pp. 17–20.

Note: This lecture invites professors to also bring their own program or policy evaluation examples, which additional graphs such as:



Critical Thinking

SI = section introduction

1. Give examples of basic and applied research questions that might be raised in the context of (1) a program to reduce adult illiteracy and (2) a program that fights international terrorism. (SI)

Ans: *Adult literacy*
Basic research questions: What is the nature of adult literacy in a specific population? How many people are illiterate? What skills do they have to learn how to read? What barriers to reading exist for them?
Applied research questions: How effective is a specific adult literacy program? Which approaches are more effective? What conditions influence the effectiveness of these approaches?

International terrorism
Basic research questions: What is the nature of international terrorism? How does it differ across countries of origin? Are different countries affected differently? What type of terrorism methods are used?
Applied research questions: How effective is an antiterrorism program? Which approaches are

more effective? What conditions influence the effectiveness of these approaches?

2. Why are both quantitative and qualitative methods indispensable in addressing questions of basic and applied research? (SI)

Ans: See p. 19: "Both quantitative and qualitative methods are indispensable in addressing questions of basic and applied research. Quantitative research requires solid knowledge of existing phenomena and how they are related to each other. Simply, before we measure something, we need to be certain that we know what we are measuring and that we are measuring the right thing. However, qualitative research does not provide much specific information about the magnitude of problems and phenomena nor can it offer conclusive, statistical proof about the impacts of programs and policies. Hence, research in public management and analysis typically uses both quantitative and qualitative research methods."

3. Give some examples of variables. Why are variables key to research?

Ans: Examples of variables include gender, environmental quality, and robberies. Variables are key to research because they are the targets of program and policies (e.g., environmental quality), which themselves are also variables.

4. A program aims to reduce adult illiteracy by providing reading sessions during evening hours. Identify the dependent and independent variables.

Ans: Dependence variable: adult
illiteracy Independent variable:
reading sessions

5. A study examines the impact of gender and drug use on school performance and political orientations. Identify the dependent and independent variables.

Ans: Dependence variable: school performance and political
orientations. Dependence variable: gender and drug use.

6. It is said that in Sweden an empirical association exists between the presence of storks and the incidence of new babies. Explain what is necessary to establish a claim of causation. Do storks really bring babies?

Ans: See p. 25: "Causation requires both (1) *empirical (i.e., statistical) correlation* and
(2) *a plausible cause-and-effect argument.*"

Storks do not bring babies because, well, they don't. However, in the context of this question, it is more appropriate to say that no plausible (logical) cause-and-effect argument exists

between the presence of storks and the presence of babies.

7. A study examines the relationship between race and crime. Is this a causal relationship or an association? Explain.

Ans: Usually such a relationship is said to be an association, because no plausible cause-and-effect argument exists between race (as in ethnic origin or skin color) and crime. Certain other, socioeconomic, community, or individual conditions associated with crime may or may not be strongly present in certain ethnic groups (as is sometimes argued), but this is not measured adequately by the variable "race."

8. Apply the following statement to program evaluation: "Research begins with asking questions." Think about a program that you know about as a basis for answering this question.

Ans: This question helps students to note the importance of asking the right (research) question, before implementing analytical activities such as program evaluation.

9. The developers of the adult literacy program mentioned in question 4 claim that the program is effective. By what measures might this effectiveness be demonstrated?

Ans: This question forces students to think about measurement, discussed in more detail in Chapter 3. The initial answer is obvious—increase literacy skills—but probing a bit further may lead to some questions insight about the amount of learning (hours of literacy training), the method of learning (and support from family members), starting levels, the equivalency of control groups, and more.

10. What might be some rival hypotheses regarding the effectiveness of this adult literacy program?

Ans: Some students are apt to want to answer this question off the cuff rather than focusing on the threats to internal and external validity discussed on pp. 36–37. A rival hypothesis might be that program participants learn simultaneously from other sources, too, not necessarily just the adult literacy program.

11. Discuss an experimental research design for testing the effectiveness of an anger management program. Then apply the three quasi-experimental designs mentioned in Box 2.1 in the text. Diagram the designs as shown in this box.

Ans: This is a detailed question that follows the text discussion on pp. 30–35.

Application Exercises

SI = section introduction

Note: I imagine instructors will choose 3–4 of the following, adapt to their own areas of

interest/knowledge, and discuss as part of the class lecture. It might help to point out to students the workbook questions you are raising/modifying.

1. Give examples of basic and applied research questions in your area of interest. (SI)

Ans: Answers vary. (see critical thinking #1, above)

2. Give examples of quantitative and qualitative research methods in your area of interest. (SI)

Ans: Answers vary, but should include—in depth interviews and focus groups as examples of qualitative research, and surveys and experimental designs as examples of quantitative methods, too.

3. Consider the following variables: the number of immigrants, attitudes toward abortion, and environmental pollution. What might be some attributes for each of the variables?

Ans: Answers vary, for example, the number of immigrants: numbers attitudes toward abortion: interview response scale (e.g., Likert-type scale) environmental pollution: measurement scale of pollutants

4. You have been asked to develop a neighborhood crime control program. Thinking ahead, you develop a strategy for evaluating the program in subsequent months and years. Define the program and identify dependent and independent variables that can be used to evaluate it.

Ans: This question makes the larger point that thinking about evaluation is a driver of program design. This problem also helps students to think about programs and policies as independent variables causing dependent variables (here, neighborhood crime). It may also help focus on equivalent groups/neighborhoods for purposes of comparison.

5. Identify a problem in your area of interest. Identify the dependent and one or more independent variables affecting this problem.

Ans: Answers vary.

6. Consider a program or policy in your area of interest. How do the specific issues raised in the text regarding program evaluation apply to your program or policy? For instance, give some examples of how difficult it can be to document program outcomes.
Ans: Answers vary, but they should touch on matters of measurement and disentangling program impacts from other impacts.

7. Discuss how you can apply the six steps of program evaluation to a specific program in your area of interest.

Ans: Answers vary.

8. Find an article that discusses a specific program evaluation and identify in it each of the six steps of program evaluation.

Ans: Answers vary. This question may be a bit difficult to answer, given that articles seldom clearly identify each of these steps in their writing. This is the lesson that needs to be communicated, as well.

9. Identify some rival hypotheses (control variables) that might affect conclusions about the effectiveness of an adult literacy program. Then, discuss how an experimental research design and several quasi-experimental designs might be helpful for determining the effectiveness of the program.

Ans: Answers vary, but all will point toward the need for statistics as a method of controlling for these other factors. See p. 31: ". . . .we can no longer rely on the research design itself to rule out the presence of rival hypotheses; rather, we must use the *strategy of statistical control* to account for rival hypotheses."

The point about control variables is also reinforced on p. 38: "The point of this lengthy list is to draw attention to concerns that analysts may want to consider in their research and evaluation. Most researchers consider at least a few or the most important rival hypotheses and threats to validity . . . ."

10. Define the objectives of a job-training program and then identify some rival hypotheses regarding possible outcomes. Explain how baselines and comparison groups might be used.

Ans: Answers vary.

Fourth Edition

Essential Statistics for PUBLIC MANAGERS POLICY ANALYSTS

Part II:
Research Methods

This section introduction . . .

- Discusses research methodology
- Distinguishes basic research from applied research
- Distinguishes quantitative from qualitative research methods

Research Methodology

- Definition: *Research methodology* is the science of methods for investigating phenomena.
- Research methods are used in almost every social science discipline.

  Examples of research methods in public and nonprofit management: knowing how to measure program outcomes, client or citizen needs, employee motivation.

Basic Versus Applied Research

Research and policy analysis involves both basic and applied research questions:

- **Basic research** seeks to develop new knowledge about the nature of phenomena. Typical questions: What is the nature of this thing? What are its causes and consequence?
- Example: What is the nature of citizen trust? What are its causes and consequences?

Basic Versus Applied Research

- **Applied research** seeks to solve practical problems. Typical question: How can this or that be improved?
- Example: How can citizen trust be increased? How can the program be delivered more effectively and efficiently?

Qualitative Versus Quantitative Research

Research and policy analysis involves both qualitative and quantitative research methods:

- The purpose of *qualitative research* is to identify and describe new phenomena. Qualitative research provides a detailed, rich understanding of what is going on and why it matters. It analyzes words (e.g., interviews), symbols, and artifacts in nonstatistical ways that give meaning and understanding.

Qualitative Versus Quantitative Research

- The purpose of *quantitative research* is to measure the extent (magnitude) and generalizability of phenomena, and determine, quantitatively, which factors are associated with each other. Quantitative research uses data (from administrative records, surveys, etc.) that are analyzed with statistical methods.
- Both qualitative and quantitative methods are needed.

Application Questions

- Identify examples of basic and applied research questions in your current or future lines of work.
- Identify examples of qualitative and quantitative research methods. Give an example that shows why both are needed.

Again . . .

1. Research methods are used in almost every social science discipline. Research methods are also used in public and nonprofit management and analysis.
2. Research and analysis in public/nonprofit organizations involve basic and applied research questions.
3. Typical basic research questions: What is the nature of things? What are its causes and consequence?
4. Typical applied research questions: How can this or that be improved?

Again . . .

5. Research and analysis involves both qualitative and quantitative research methods.
6. Qualitative research aims to identify new phenomena and their meaning.
7. Quantitative research aims to measure the extent (magnitude) of phenomena, and determine quantitatively how other factors affect them.

Chapter 2:
Research Design

This chapter . . .

- Discusses variables
- Describes how to conduct program evaluation
- Explains (quasi-)experimental designs
- Discusses why rival hypotheses and threats to validity matter

Variables and Attributes

What is a variable?

- A *variable* is an empirically observable phenomenon that varies.
- Examples: high school violence, gender, income, well-being.

Note: Constants are phenomena that do not vary.

Variables and Attributes

What are attributes?

- *Attributes* are the specific characteristics of a variable, that is, the specific ways in which a variable can vary.
- Example: The attributes of the variable “gender” are “male” and “female.”

  Application Question: Identify examples of variables and attributes.

Relationships

Research usually involves both descriptive analysis and the study of relationships:

- *Descriptive analysis* provides information about the nature of variables—such as whether a high school violence problem exists and the extent or level of it.
- *Relationships* involve specifying which variables are related to each other and how they related (e.g., in a positive or negative relationship).

Relationships

- *Associations* are relationship that imply no cause and effect, such as between births and storks in Sweden.
- *Causal relationships* show cause and effect, such as the impact of anger management programs on high school violence:
- Anger management $\rightarrow$ High school violence
- Relationships in social sciences are typically probabilistic in nature.

Independent and Dependent Variables

Among causal relationships, we further distinguish:

- *Dependent variables* are variables that are affected by other variables (hence, they are dependent on them).
- *Independent variables* are variables that cause an effect on other variables but are not themselves shaped by other variables (hence, they are independent).

Independent and Dependent Variables

Independent Variable		*Dependent Variable*
Anger Management	→	High School Violence

An important step in any research is specifying the dependent and independent variables. Doing so brings clarity and direction to the research.

Application Question: Identify examples of independent and dependent variables.

Relationships—Causality

- *Criteria for causality*: Causation requires both (1) empirical (that is, statistical) correlation and (2) a plausible cause-and-effect argument.

  Note: see footnote 3 in book for additional criteria.

- Statistical analysis tests whether two variables are correlated, but causality also requires a persuasive argument (also called 'theory') about how one variable could directly affect another.

  Note: Variables should not be spuriously caused by another, third variable: see footnote 6 in book for example.

Hypotheses

- Relationships that have not yet been empirically tested are called *hypotheses*.

  Example: A study hypothesis might be that, on average, female teenagers are less prone to violence than males. Then, data need to be collected to determine whether this is in fact the situation in a specific study population.

Program Evaluation

Program evaluation deals with relationships. Six steps of program evaluation:

1. Define the activity and goals that are to be evaluated.
2. Identify which key relationships and variables will be studied.
3. Determine the research design that will be used (e.g., control groups, baselines).

Program Evaluation

More . . .

4. Define and measure study concepts (see Chapter 3).
5. Collect and analyze the data (e.g., surveys, administrative data, statistics methods).
6. Present study findings.

Rival Hypotheses

- Alternative explanations for observed outcomes are called *rival hypotheses*, and variables used to measure rival hypotheses are called *control variables.*
- Example: What if, parallel to anger management, another program aims to reduce student access to weapons? Student access to weapons, then, is a rival hypothesis of the impact of anger management on high school violence.

Research Design

- The purpose of *research design* is to determine the effect of program interventions on study outcomes, given the presence of other rival hypotheses that may also affect study outcomes.
- Rival hypotheses (and their associated control variables) can be dealt with through experimental designs and/or statistical analysis.

Research Design

- Experimental designs address rival hypotheses through the use of control groups, which are similar to the study group in all aspects except that members of the control group do not participate in the program or policy intervention.
- In the *classical, randomized research design*, participants are randomly assigned to either a control or an experimental (study) group. The random assignment ensures that any observed differences between these groups are due only to treatment (intervention) and not to any other factor.

Research Design

Research designs can be characterized using the following notation, where R = randomization, X = intervention, and O = measurement. The following is based on the enduring, classic work of Donald Campbell and Julian Stanley.

A. The classic, randomized design is depicted graphically as follows. Any significant program impact would be indicated when (O2–O1) > (O4–O3). The placebo intervention is not shown, but if it existed it would be implemented between O3 and O4; it would be similar to X, except that it is intentionally ineffective.

	Pretest	Program	Posttest
Group 1:	R O1	X	O2
Group 2:	R O3		O4

Research Design

- Classical, randomized experiments are difficult to implement in public administration and policy because it is difficult to randomize subjects and it is often legally and ethically impossible to deny citizens or jurisdictions programs and policies.
- *Quasi-experimental designs* do not fully meet the standard of classical designs, yet the use of (1) baselines and (2) comparison groups provide valuable information in program evaluation.

Research Design

B. Quasi-experimental designs vary from this design in several ways:

1. Research design with a nonrandomized comparison group:

	Pretest	Program	Posttest
Group 1:	O1	X	O2
Group 2:	O3		O4

2. One-group research design with posttest measure, only:

	Pretest	Program	Posttest
Group 1, only:		X	O2

3. Research design with comparison group and posttests, only:

	Pretest	Program	Posttest
Group 1:		X	O2
Group 2:			O4

4. One-group research design with pretest and posttest:

	Pretest	Program	Posttest
Group 1, only:	O1	X	O2

Application Questions

Consider how an anger management might reduce high school violence:

- Identify three other rival hypotheses.
- Explain how a control group can help your evaluation.
- Explain how a baseline can help, too.
- Explain the difficulty of using the classical, randomized design.

Threats to Validity

- Most program evaluations also involve *threats to validity*, which are further rival hypotheses that affect study conclusions. Analysts will want to collect data about (some of) these threats in order to test them.
- Threats to *external validity* are those that jeopardize the generalizability of study conclusions about program outcomes to other situations. Example: study samples that are not generalizable to other settings.

Threats to Validity

- Threats to *internal validity* jeopardize the logic of study conclusions, that is, whether interventions really do cause a difference in the study population.

- A useful acronym for remembering threats to internal validity is “Mis Smith:” maturation, instrumentation, selection, statistical regression, mortality, imitation, testing, and history.

Threats to Validity

(acronym: *Mis Smith*)

***M**aturation:* subjects develop during study period

***I**nstrumentation:* bias caused by measurement

***S**election:* study/control groups are not comparable

***S**tatistical regression:* extreme scores average out

***M**ortality:* attrition of study subjects over time

***I**mitation:* subjects imitate behavior of others

***T**esting:* effects of measuring on subject behaviors

***H**istory:* events that occur during the study

In Summary

What to know . . .

1. Variables are empirically observable phenomena that vary. Variables are ubiquitous and central to analysis.
2. Attributes are the specific characteristics of a variable.
3. Descriptive analysis provides information about the nature or state of phenomena.
4. Relationships involve ways in which phenomena are related to each other.

In Summary

5. Most relations in social sciences are probabilistic, that is, occurring most of the time.
6. Associations are relationships that imply no cause and effect.
7. Causal relationships show cause and effect.
8. Dependent variables are variables that are affected by other variables.
9. Independent variables are variables that cause an effect in other variables and are not affected by other variables.

In Summary

10. Causality requires empirical correlation as well as a plausible cause-and-effect argument.
11. A hypothesis is a relationship that has not yet been empirically tested.
12. Program evaluation deals with relationships. Six steps of program evaluation:

    (i) Defining the goals to be evaluated, (ii) specifying key relationships, (iii) selecting a research design, (iv) defining and measuring study concepts, (v) collecting and analyzing data, and (vi) presenting study findings.

In Summary

13. Alternative explanations for study outcomes are called rival hypotheses.
14. Rival hypotheses are addressed through research designs and/or statistical methods.
15. The purpose of a research design is to determine the effect of program interventions on study outcomes, given the occurrence of rival hypotheses and other factors.
16. Classical, randomized research designs are difficult to implement in public administration and policy.

In Summary

17. Quasi-experimental designs do not fully meet the standard of classical designs, yet baselines and comparisons groups provide valuable information.
18. Most program evaluations involve a few threats to validity that analysts will want to consider as additional rival hypotheses. Analysts need to collect data about them.
19. Threats to external validity jeopardize the generalizability of study conclusions to other situations.
20. Threats to internal validity jeopardize the logic of study conclusions (use the pneumonic Mis Smith).