Fourth Edition

Essential Statistics for PUBLIC MANAGERS & POLICY ANALYSTS

EVAN BERMAN | XIAOHU WANG

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Essential Statistics

for Public Managers and Policy Analysts

Fourth Edition

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"IN GREATER DEPTH . . . " BOXES

This fourth edition of *Essential Statistics for Public Managers and Policy Analysts* continues the positive features of the previous editions: brevity, straightforward instruction, and hands-on application—the defining features of this textbook and set. This edition, like the previous ones, continues to provide professors with a flexible approach that is student-friendly, professor-friendly, and meets learning outcomes. Professors who teach statistics know well the challenge of balancing the teaching of statistical concepts with providing the practical applications that students value. This book is very math-friendly, eliminating the need for students to make complex calculations—that's what computers will do—and professors have freedom to tailor the material in ways that best suits their learning objectives, adding their own material or additional exercises. The book and its set are a complete and adaptable teaching resource, helping professors maximize their success for what they want to do in this course. Professors can quickly adapt the material to the abilities of their students and the availability of software—be that Excel®, SPSS®*, or other programs. Students will find this a quick and easy read (as much as any statistics book can possibly be), and academic programs can rest assured that this text is consistent with helping them meet post-2009 accreditation standards of the Network of Schools of Public Policy, Affairs, and Administration (NASPAA), which accredits programs in public affairs, such as those in public policy, public administration, and public management.

We are truly honored and humbled by the widespread and increased use of this text. The last edition received highly favorable reviews in the leading journal of the discipline, *Journal of Public Administration Research and Theory*,[1] calling it "effective," "student friendly," and "leading," providing students with

*SPSS is a registered trademark of International Business Machines Corporation.

"sufficient grounding to effectively apply a wide array of statistical tools to inform better administrative or policy decisions." Not only is this book used in programs of public policy and public administration, but adoption lists also show increasing use in such programs as criminal justice, urban affairs, public health, political science, psychology, and nursing, too. With this edition, *Essential Statistics* continues to offer a conceptual understanding and practical application of statistics that is its hallmark. This edition has again benefited from user and reviewer feedback. Specifically, we made the following improvements:

- We added even more policy-relevant examples in the text.
- We dropped the separate chapter on nonparametric statistics and moved what was relevant to the preceding Chapter 11, dealing with chi-square. Very few users actually used this prior chapter (the original chapter remains available as supplemental e-learning for instructors).
- We have provided a brief, new Chapter 10, which provides more coverage of probability theory and sampling distributions, as requested by some users.
- We solicited applications and syllabi from users and made these available, either in the textbook or as teaching material. The latter is our attempt at some "crowdsourcing."
- We combined the previous edition's three chapters on advanced statistics into two chapters, as feedback shows that instructors lack time to cover this material. In doing so, we also moved non-regression-based forecasting to Chapter 9 (with an appendix, too).
- We added a new dataset on public expenditures for conservation and associated exercises in the workbook (*Exercising Essential Statistics*).
- We slightly reduced the length of the book.

The success of this book confirms that people want a practical approach to doing and using analysis. The conceptual and hands-on approach in *Essential Statistics* is popular among students and professors alike; the availability of user-friendly and affordable statistical software has long since ended much of the rationale for doing hand calculations. The text restricts hand calculations to situations in which they strengthen and enhance students' understanding of basic statistical concepts (such instances are very few). The text presents the assumptions, purposes, and applications of statistics, illustrated by real-world examples and numerous tables, charts, and graphs. Learning objectives start off each chapter, and key terms are set in bold italic in the text and listed at the end of chapters for quick and easy review. The book gets to the point quickly, and there are "In Greater Depth . . . " features and "Getting Started" and "Key Point" boxes that point students in useful directions.

This book is for both one- and two-semester courses. If the program requirement is for a separate course on statistics, the instructor may want

to exclude some of the book's material on research methods. Yet those early chapters may serve as a handy refresher for some students. If the program requirement combines quantitative methods with research methods, then the section on research methods provides needed material, and such courses may skip some of the later chapters in the book, which cover advanced topics. The additional datasets and exercises help strengthen both types of courses.

Finally, globalization and internationalization are occurring in full force, and this book is used outside the United States, too. Also, since the second edition, Evan moved from Louisiana State University to Victoria University of Wellington, New Zealand's only school of government, and XiaoHu moved from the University of Central Florida to the City University of Hong Kong, which has one of Asia-Pacific's premier research programs in public administration. Yet U.S. professors and students should rest assured that we are firmly committed to meeting their needs and requirements, including for NASPAA accreditation. Indeed, Evan has been promoting NASPAA-based accreditation in New Zealand, and several programs in Asia-Pacific are now NASPAA-accredited or currently seeking that.

A UNIQUE LEARNING PACKAGE

This textbook is part of a unique resource set consisting of several valuable teaching tools. Developed in tandem with one another, each piece has been crafted as part of a larger learning package to enhance and reinforce lessons learned in the classroom.

Exercising Essential Statistics

The accompanying workbook complements the textbook. Its aim is to strengthen students' learning and extend their ability to apply the material from the text, offering them opportunities to practice through carefully crafted exercises. This fourth edition of *Exercising Essential Statistics* contains even more exercises for students to work through, from which instructors can choose. Corresponding directly to the core text, workbook chapters cover the same learning objectives and consist of four parts that facilitate learning, testing, and application. The first part, "Q&A," identifies key learning points in a question-and-answer format to help students test their comprehension. The second part, "Critical Thinking," contains open-ended questions designed to stimulate students' thinking and deepen their insight. The questions carry the material one step further and are excellent for in-class teaching, discussion sections, and homework assignments. The third part, "Data-Based Exercises," includes computer-based applications that use the datasets provided on the companion website: http://study.sagepub.com/bermaness4e. These exercises will help students get comfortable working with data. The fourth section, "Further Readings," lists other books, resources, and examples for anyone interested in further research. Workbook pages are

perforated and three-hole punched so that students can easily turn in work for credit and later save it for reference.

The datasets reflect students' and professors' preferences for real-life data that shed light on important problems and issues that arise when working with data. The datasets cover experiences of the public and nonprofit sectors. They are based on employee and citizen surveys as well as environmental, welfare, and public safety data. This fourth edition includes new datasets, such as quality-of-life indicators for cities and data relevant to nonprofit organizations. In a few instances, plausible hypothetical data are used. The sets include both cross-sectional and time series data. They contain complete documentation, including survey instruments, which many readers will find useful. Data are provided in Excel, SPSS, Stata, SAS, and SYSTAT formats so that students can access these sets with a range of software programs (or import them into another program of their choice). Recognizing the widespread use of Excel and SPSS, the workbook includes chapters on Excel and using SPSS. The last chapter of the workbook provides documentation for the datasets available on the companion website: http://study.sagepub.com/bermaness4e.

The workbook and datasets span a wide range of areas and are designed to support integration with other areas of study in master's degree programs in public policy and public administration. The workbook covers many examples from human resources management, organizational behavior, budgeting, and public policy. The problems are written with those students in mind who have not yet taken these courses. In addition, the datasets are quite extensive, enabling professors to develop additional applications in the areas they choose to emphasize.

Instructor Resources

A complete suite of instructor resources—created by the authors—are available to adopters. Homework assignments, test questions, PowerPoint lecture slides, sample syllabi, and a solutions manual to the workbook's exercises will help lessen class prep time and assist with teaching. To access these resources, please go to **http://study.sagepub.com/bermaness4e** to register and download materials.

Note

1. Yahong Zhang, "Teaching Statistics with Effective Textbooks," *Journal of Public Administration Research and Theory* 24 (2014): 246–53; Adam Douglas Henry, "The Challenge of Statistics Education in Master of Public Administration Programs: A Review of Two Popular Textbooks," *Journal of Public Administration Research and Theory* 24 (2104): 235–43.

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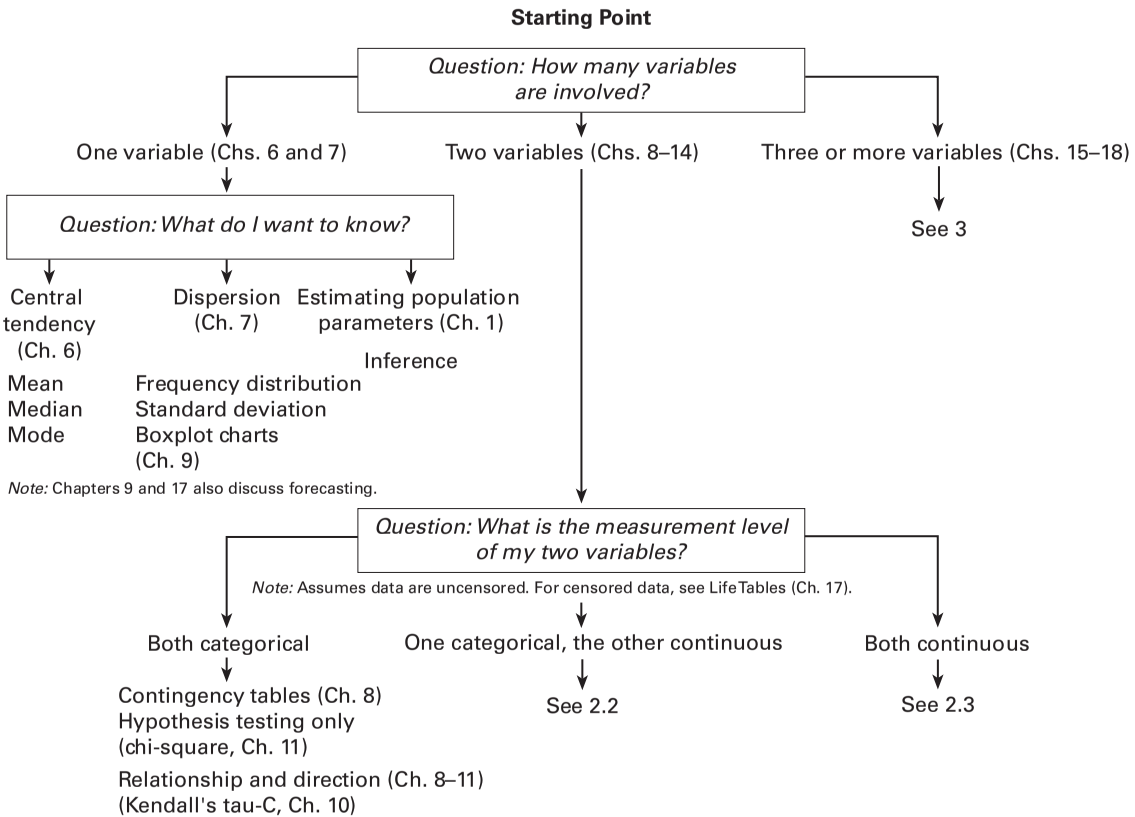
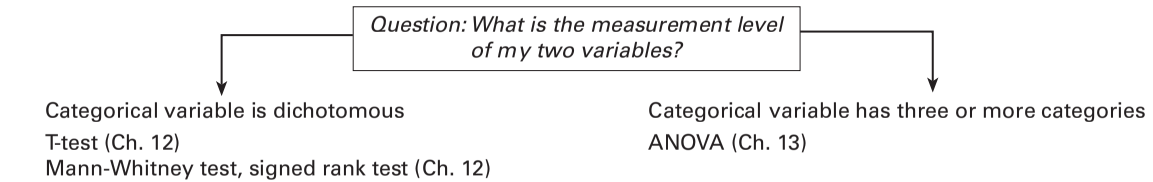
Statistics Roadmap



2.2 Bivariate Analysis—One variable is categorical, other variable is continuous



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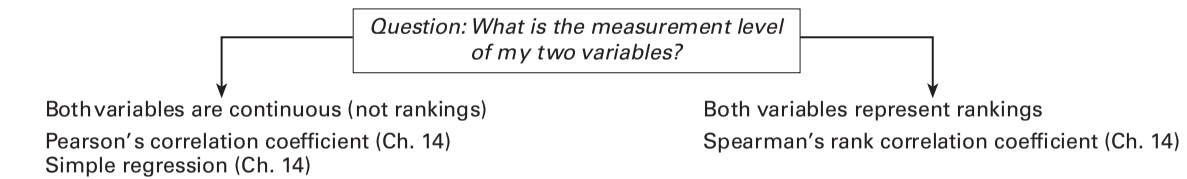
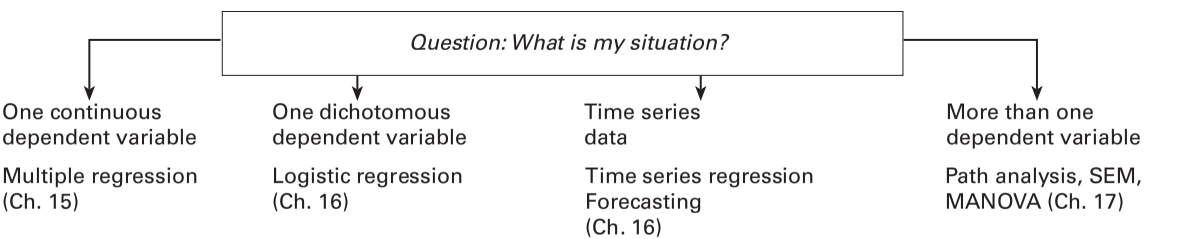


3. Multivariate Analysis (Ch. 15–17)



Introduction

For many professionals and students, past experiences with statistics often have been less than fully satisfying—perhaps nightmares best forgotten. This is increasingly unnecessary and doubly unfortunate, as it also deprives of professional abilities, impacts, and rewards. This book, now in its fourth edition, is guided by the underlying philosophy that statistics is an enterprise that is both increasingly easy and practical. Modern advances in computers and software have reduced the importance of hand calculations, allowing students to work readily with real-life applications. Conceptual understanding and application are central to statistics, not arithmetic and cumbersome calculations. And practices in policy analysis and management require quantitative abilities to a varying but necessary extent, with "big data" and real-time delivery and accountability, now more than ever.

For public managers and analysts, this book shows how to apply the principles and practices of statistics to problems of public management and policy analysis. Whether through program evaluation; policy analysis; performance measurement or management; or program client, citizen, or employee surveys, statistics offers public managers and policy analysts ample opportunities for "speaking truth to power"[1] and improving their communities or agencies. In doing so, these professionals inform public discourse, add value to democratic processes at all levels of government, and improve programs.

This book is part of a set that consists of

- A textbook: *Essential Statistics for Public Managers and Policy Analysts*
- A workbook: *Exercising Essential Statistics,* which includes
  - Exercises with applications in public management and policy analysis
  - Datasets and presentations in various formats

The textbook can be used apart from the workbook (it stands alone), and the workbook, while assuming the use of a statistical software package for analysis, is not committed to any particular software. The textbook is written in an accessible, direct, and economical style, and includes features that make it easier to understand statistics and to benefit from its application. A flowchart located in the front of the book, called the "Statistics Roadmap," is a quick reference tool that will help guide readers to choose the correct statistical method for their research. From there, chapters build upon each other, taking the reader from the very fundamentals of research design all the way through advanced statistics. Each chapter begins with a list of learning objectives—the skills and concepts students can expect to know when they have finished reading. Key terms are shown in bold italic and are listed at the end of each chapter for easy reference.

The workbook extends conceptual understanding through application of statistics principles, drawing on the practical problems. The workbook chapters correspond to the equivalent chapters in the textbook and are organized in four parts: "Q & A" reinforces key learning points and assists in test preparation; "Critical Thinking" stimulates insight into statistics principles; "Data-Based Exercises" emphasizes hands-on skill-building and additional applications; and "Further Reading" recommends books for further study in areas of interest. The workbook is an integral part of this set and is recommended. The datasets are based largely on real-life data and include employee and citizen surveys, as well as topics of environmental, welfare, and public safety interest, relevant to all levels of government. The last chapter of the workbook contains complete documentation for the datasets. The workbook includes a tutorial for using SPSS and advanced Excel features. The website for accessing the datasets is http://study.sagepub.com/bermaness4e, which includes bonus material, too, such as reports. Data are provided in Excel, SPSS, and other common formats (such as Stata and SYSTAT).

The workbook, together with these datasets, shows students how to apply statistics to practical problems in the real world. We hope that after using this learning package, readers will see how practical and easy statistics can be and how the effective use of statistics can help them. *We'd like to hear from you.* Please let us know what features you like and what should be improved upon. Or feel free to contribute a problem or example from your experience—if you wish, we

can share it with others through the website. Don't be shy—our email is below! Now, let's get started.

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Note

1. This old phrase is borrowed from the classic work of Aaron Wildavsky, *Speaking Truth to Power* (Boston: Little, Brown, 1979).

Why Statistics for Public Managers and Policy Analysts?

CHAPTER OBJECTIVES

After reading this chapter, you should be able to

- Appreciate the importance of using data in public management and policy analysis
- Identify levels of competency and proficiency in data analysis
- Describe strategies for increasing proficiency in data analysis
- Understand the importance of ethical principles in data analysis

ROLE OF DATA IN PUBLIC MANAGEMENT

Why research? Why statistics? The ethos of public management is to "go out and make a difference," not to sit behind a desk and crunch numbers. Public managers often join agencies because they seek to serve and help their communities and country. Not surprisingly, some managers are puzzled by the suggestion of engaging in research and statistics: research appears boring in comparison with developing and implementing new programs, and statistics seems, well, impossibly challenging with little payoff in sight.

In fact, analytical techniques involving research and statistics are increasingly in demand. Many decisions that public and nonprofit managers

make involve data and analysis, one way or another. Consider the following common ***uses of analysis and data.***

First, data and objective analysis often are used to *describe and analyze problems,* such as the magnitude of environmental disasters (for example, oil spills), the extent of social and public health problems (such as homelessness or the AIDS epidemic), the extent of lawlessness, the level of economic prosperity or stagnation, or the impact of weather-related problems such as brought on by hurricanes and snowstorms. For example, it matters whether the illiteracy rate among 12-year-olds is 3 percent or 30 percent, or somewhere in between. By describing the extent of these problems and their underlying causes accurately, managers are able to better formulate effective strategies for dealing with them. Policy analysis often begins by describing the extent and characteristics of problems and the factors associated with them.

Second, data are used to *describe policies and programs.* What are programs and policies expected to achieve? How many services are programs expected to provide? What are some milestones of achievement? How much will a program cost? These questions involve quantifiable answers, such as the number of national guardsmen brought in to assist with search and rescue efforts after a major hurricane, or the number of evacuees for whom officials expect to provide refuge. Analysis helps think about policies and programs in detailed ways, linking resources to efforts to outputs and final outcomes, and a need exists to attach numbers to these elements, such as the level of resources committed to literacy programs and their results, and so on. Policies and programs can be described in quite detailed ways, involving distinct program activities, the duration and geographic scope of activities, and staffing levels and area program budget data.

Third, policies and programs produce much routine, administrative data that are used to *monitor progress and prevent fraud.* For example, hospitals produce a large amount of data about patient visits, who attended them, their diagnoses, billing codes, and so on. Regulatory programs produce data about inspections and compliance. In many states, gaming devices (such as slot machines) are monitored electronically to ensure that taxes are collected and that they are not tampered with. Administrative data assist in monitoring policies and programs, and managers are expected to be familiar with these data, and provide careful tracking of them.

Fourth, analysis is used to guide and *improve program operations.* Data can be brought to bear on problems that help managers choose among competing strategies. Some examples are the "big data" uses by large city policy departments, and increasingly broader "Citistat" programs that track a broad number of services to citizens. But examples are found at all levels, including in departments that lack expensive data systems. A modest amount of data and a spreadsheet can be sufficient for a "what-if" analysis that assesses the cost-effectiveness of alternative courses of action. In addition, systematic surveys provide valid and objective assessments of citizen and client needs, priorities, and perceptions of programs and services that are also used to improve programs.

Fifth, data are used to *evaluate outcomes.* Legislatures and citizens want to know what return they are getting from their tax dollars. Did programs and policies achieve their aims? Did they produce any unexpected results? Most grant applications require public managers to be accountable for program outcomes. Public managers must demonstrate that their programs are producing effective outcomes and that they are doing so in cost-effective ways. This demand for outcome evaluation and monitoring far exceeds any requirement of proper funds management; it requires a comprehensive framework. Analysis can also be used to determine the impact of different conditions on program effectiveness, leading to suggestions for improving programs.

Getting Started

How are these uses of data and analysis present in your field?

Data and analysis are thus omnipresent in programs and policies. They are there at every stage, from the inception of programs and policies to their very end. Of course, decisions are also based on personal observations, political consensus, anecdotal and impressionistic descriptions, and the ideologies of leaders. Yet analysis and data often are present, too, one way or another. Specifically, quantitative analysis aids in providing an objective, factual underpinning of situations and responses. Even more, analysis is more than data analysis; it is grounded in research methods that provide a rigorous way of understanding policies and programs, and about asking certain questions about them. Analysis helps examine and quantify the extent of problems, solutions, and likely impact of proposed strategies in ways that other information seldom can. At the very least, a focus on facts and objective analysis might reduce judgment errors stemming from overly impressionistic or subjective perceptions that are factually incorrect. Managers are expected to bring data and analysis to the decision-making table.

COMPETENCY AND PROFICIENCY

Competencies. Analysis requires competency and proficiency. The accrediting organization, the ***Network of Schools of Public Policy, Affairs, and Administration (NASPAA),*** requires that such programs in public policy and administration provide evidence of their graduates' abilities in five "universal required competencies," and most (if nearly all) programs require statistics to help meet this. Students must have skills to participate in and contribute to the policy process; lead and manage in public governance; communicate and interact productively with a diverse and changing workforce and citizenry; analyze, synthesize, think critically, solve problems, and make decisions; and articulate and apply a public service perspective.[1] As Henry notes, "empirical data and analysis are important forms of currency in the policy process . . . and one must be aware of the potential misuse of statistical analysis,"[2] hence requiring

foundation in research methods and the ability to produce valid conclusions from data, generate data in valid ways, and communicate these effectively to diverse stakeholders and leaders. Statistics are obviously also involved in managing organizations, analyzing performance, workforce issues, financial management, and more, while applying a public service perspective further shapes the content (what is analyzed) and the communication of analysis. Thus, consensus exists that the statistics course contributes in many ways to meeting NASPAA accreditation standards.

Other accreditation bodies also recognize the role of quantitative skills. The relatively new ***International Commission on Accreditation of Public Administration Education and Training Programs*** (ICAPA) drafted its standards in cooperation with a United Nations task force. It states that curriculum components should include the "application of quantitative and qualitative techniques of analysis" in such areas as "institutional and developmental economics," "policy and program formulation, analysis, implementation and evaluation," and "decision-making and problem-solving."[3] The ***European Association for Public Administration Accreditation*** (EAPAA) follows a similar, "mission-based" accreditation approach as NASPAA, but without identifying five specific competencies. Rather, it states that programs must provide evidence that "curriculum components . . . produce professionals capable of intelligent, creative analysis and communication, and action in the public sector," that "courses taken to fulfil the core curriculum components provide research methods," and that the program includes "adequate training of practical skills." Having some level of quantitative ability is surely consistent with this, too, of course.[4]

In short, the overwhelming consensus is that public managers and policy analysts need a firm grasp on analyzing data and their uses in policy and managerial processes, though programs have much leeway to define the way they bring statistics and analysis to furthering this. This capacity for leading policy and management implies the need for six ***competencies for analysis***. First, managers and analysts should be *familiar with data sources* in their lines of business. They will need to know what data are available and to what uses they are commonly put. For example, are they used for monitoring? For estimating service needs? For determining program efficiency? For describing community conditions? Managers will also need to assess the validity of these data, and know the criteria by which validity is judged, including the processes and purposes for which they have been collected. Indeed, managers will need to know what sources of intelligence exist in their area, and data sources are an important and necessary part of that.

Second, managers and analysts need competencies to *gather their own data.* Simply, existing data do not always address important issues at hand. For example, they may not be adequate to determine client needs or evaluate

programs. The ability to collect new data implies familiarity with and competencies in conducting different types of research, such as archival research, or in conducting scientific population or program client surveys. Many managers value the ability of their staff to conduct these types of research. Client and citizen surveys are increasingly a staple of public management. Sometimes, data are assembled from ongoing operations or large, "big data" sets in ways that provide analysts with the datasets they need.

Third, public managers and analysts need to be able to *analyze the data.* Without analysis, it is not possible to generate meaningful information about program efficiency and effectiveness, for assessing whether a program is on track, and for determining and identifying new client needs. Analysis requires competency in statistics. Analysis must be done in ways that shine light on important problems. It must also be done in ways that are sound, defensible, objective, and consistent with current practice. Policy analysts are often called upon to put existing data to new uses; this requires the development of creative skills and insight.

Fourth, public managers and analysts should be able to *communicate* their results. Communication requires the ability to explain complex or abstract concepts in ways that are suited to very different audiences—both those with very little understanding of statistics as well as those with deep professional skills. Results should be explained in simple ways that are easy to understand without oversimplifying. Communication also involves effective writing and presentation skills; yes, analysts must also be able to produce clear, professional-looking graphs and charts that communicate their results to a diverse public. Communication is also often used to meet additional objectives of accountability and transparency.

Fifth, analysts must be able to bring to their analysis *the theory and practice of management and policy analysis.* Understanding the specific and unique problems of public and nonprofit programs and their context informs analytical tasks to be carried out. The needs of homeless people in New York City are different from those in Louisiana, as are the priorities of stakeholders and affected publics. Analytical tasks must be infused, from the start, with a clear sense of the specific program and contextual issues; without context or purpose, analysis is a blind exercise in technique only, not connected to purpose.

Sixth, analysts must have a sound and strong sense of *ethics.* Technical skills alone are not enough to ensure soundness of analytical purpose and practice; analysis also requires a commitment to being truthful, complete, mindful, and useful. Ethics affects how analysts and managers approach matters of analysis and communication and how they view the role of research and analysis in their field. Ethics affects which questions analysts and managers ask, and how they deal with them. Ethics is a hallmark of modern professionalism and a key to public service; it is discussed in greater detail in the next section.

The aforementioned competencies are also grounded in the canons of scientific research. ***Scientific research*** is the careful, systematic process of inquiry that leads to the discovery or interpretation of facts, behaviors, and theories. Science sets a high standard for what is considered to be valid knowledge that is distinguished from personal and other forms of personal inquiry or informal research. The methods used for scientific research include standards and procedures for gathering, analyzing, and reporting data. As a branch of science, ***statistics*** is the body of systematic knowledge and practice that provides standards and procedures for correctly analyzing one's data, and for drawing conclusions from them. Research and statistics provide essential frameworks for the above. This is surely not to say that all knowledge or information used by managers meets or should meet scientific standards; public policy and management data often are incomplete, biased, or inaccurate in some way. Knowledge of science standards helps managers and analysts to better evaluate their data and results, thereby avoiding problems and providing stronger justifications. Scientific standards and methods help managers and analysts caveat their data in appropriate ways, thereby furthering acceptance, credibility, use, and impact. In short, knowledge of scientific standards and research, discussed in this book, cannot be ignored without sacrificing one's credibility.

Proficiency. Students and managers seeking to improve their competency often experience different ***stages of proficiency***. Understanding these stages helps guide one's progress and development activity, and also helps in dealing with others.

Know-Nothing. Many people who are new to public and nonprofit management do not bring with them much background about data in their lines of business, or ways in which data might be used for improving program efficiency. This is not a problem but a fact. A good share of these students are reserved, skeptical, fearful, or even hostile about the uses of data and statistics. Then they will need to acknowledge these feelings and work to become aware of ways in which data are usefully and correctly applied in management and policy analysis. To get beyond this stage, they will need to obtain a good foundation in research and statistics, and succeed in finding useful examples in each of the five areas of use described earlier.

Journeyman. People in this stage have worked for a few years in their lines of business. As such, they have usually seen some applications and are clear about the utility of data and analysis. They sometimes use data for monitoring program progress. However, lacking research and statistics skills, they often do not see themselves as being qualified to develop broader applications or even to analyze data in relatively simple ways. The purpose of this course is to provide readers with the necessary foundations and skills and to encourage the development of new uses of data and analysis in their lines of business. People at this level are

often concerned about the validity and effective communication of data-based results, and these skills are also to be focused on.

Technocrat. People in this stage have acquired varying levels of technical mastery of research and statistics. Some technocrats are highly skilled, whereas others have only a modest level of ability. A common problem is that technocrats are unable to integrate and guide their analysis with the substantive concerns of programs and policies in their lines of business. They might even view themselves as statistics resource persons, rather than as managers and employees tied to specific programs and policies—the fifth competency (relating research and statistics to the theory and practice of management and policy analysis) is missing. The main challenge for technocrats is to learn how to put research and statistics in service of programs and policies. They need to put these substantive concerns on par with the technical analysis.

Sophisticated Expert. People in this stage have found the right balance between the development of policies and programs and the use of objective data and analysis to further decision making. They understand both. Because they have spent several years in their lines of business, they are familiar with the relevant existing data, they know the strengths and weaknesses of these data, they are familiar with a range of applications, and they are able to develop new applications and collect original data. They are well-rounded in the use of data. Sophisticated experts often have a positive orientation toward continuing, professional education. They may challenge themselves by writing articles for scholarly journals and making presentations at conferences.

Getting Started

At which stage of proficiency do you see yourself today? Which competencies and uses of data and analysis would further your career?

At whatever your stage of proficiency, think of how you can benefit from increased use of data and analysis. Competencies with data and analysis are increasingly used skills in public and nonprofit organizations. Whether positions are analytical, such as in policy analysis, budgeting, or information technology, or people oriented, such as in counseling, human resources, or social services, analytical skills are in demand for analyzing data, conducting surveys, and communicating quantitative findings to a broader audience. Program managers, city managers, and elected officials, too, require a solid grasp of analytical skills, for monitoring performance, detecting fraud, and improving productivity. Almost every department needs people with analytical skills, and jobs associated with analytical skills often command a salary premium.[5]

ETHICS IN DATA ANALYSIS AND RESEARCH

The effectiveness of data and analysis in decision making depends on more than just technical competency; it also depends on the ethical integrity with

which analysis is performed and presented. When questions surface about the ethics of analysis, its credibility suffers, and people may be unwilling to give it much, if any, consideration. Specifically, there are three ***areas of ethical concern:*** (1) the integrity of purpose, (2) the integrity of the process of analysis and communication, and (3) the integrity of dealing with human subjects. When research and analysis are clear about these matters, and technically proficient, too, then the role of analysis in decision making and policy may be enhanced.

Scientific misconduct is generally understood as the violation of the standard norms of scholarly conduct and ethical behavior in scientific research. Though some research norms are codified by associations and employers, and others are sometimes stated explicitly in research grants and contracts, the scientific community has also reached a general understanding of what these standards are. Violations of the norms include and go beyond plagiarism and data falsification, which have been well popularized. As in any community, the failure to live up to stated and unstated norms can have harsh consequences. This section enumerates key principles and norms of research and analysis. Scientific misconduct, when considered by others as significant or severe, can cause not only one's diminished reputation, but also exclusion from participation and even expulsion and the possibility of career termination and legal action; however, showing that one's analysis meets high research ethics can increase both its credibility and quality. There is good reason, indeed, for taking the following discussion seriously.

First, managers need to be clear about the purpose of their analysis. Analysis often has ***dual purposes***: (1) to further programs and policies, such as by making them more efficient or effective, and (2) to establish factual, objective truths that meet standards of scientific evidence and that hold up under scrutiny. The first purpose causes analysis to focus on matters that are relevant to the agency and its mission; analysts need to be forthright in disclosing what questions they considered, and those which they did not—no analysis can cover everything. The second purpose implies that analysts should be open to all facts, whatever they are, and ensure that all facts comply fully with standards of scientific evidence. Analysts must disclose and issue caveats for instances in which this is not the case. Ethics in analysis requires full disclosure of the purpose of the analysis, and all the biases, trade-offs, and shortfalls encountered along the way.

These dual purposes can come into conflict, forcing ethical choices and decisions. For example, what is a manager to do when careful analysis shows his or her programs to be less effective than hoped for? Should pursuit of mission cause a blind eye to facts that are contrary? Such results may indicate the need for further research or to consider future program changes. Consider another example: Should the agency intentionally ignore questions or analysis that could strengthen the arguments of those who advocate against the program or agency? Agencies cannot totally ignore their fiduciary responsibilities to society at large and thus

their broader impacts. Such counterarguments should be taken into consideration in some way, and they need to be shown in analysis. These tensions are quite common in practice, and they cannot be ignored or swept under the rug.

Second, managers need to consider the integrity of the analysis and communication process. Many of these considerations are based on the ***guiding principles of scientific research***—to be honest, objective, accurate, and complete. Analysts should not hide facts, change data, falsify results, or consider only data that support a favored conclusion. For example, data may be sketchy and incomplete, and management judgment is that such information is better used than ignored. In this case, the poor quality of the information needs to be stated clearly and a caveat given. Analysts should also fully report the sources of their data, data collection methodologies, and any possible gaps and shortfalls, and they should assess the impact of such shortcomings on their findings.

It is obvious that facts and findings should not be altered or manufactured in any way. That is outright lying, and people will be justly outraged to know that they have been deceived. Data fabrication and any study falsification are very serious forms of scientific misconduct, and many scientists feel that the omission of relevant counter-conclusions is equally serious. Regrettably, each year cases of scientific misconduct and fraud make headlines. It is equally important that analysis be as meticulous and objective as possible in testing its own findings. Findings should be checked for errors and inaccuracy. Conclusions should be examined for the possibility of alternative or rival explanations. The impact of assumptions, gaps, and bias should be examined. Doing so is not only proper, but it also strengthens study findings by providing detailed knowledge about their validity and robustness. The more that is known about the data and results, the more confidence that others may have in them.

Communication in research matters, and results should be presented in straightforward and nonmisleading ways. For example, analysis should not adjust scales to give the appearance of a significant increase when the increase is in fact minor and insignificant. Such misrepresentations are considered the same as lying with statistics. Findings should be communicated in ways that are straightforward and easy to understand, for both experts and nonexperts, without oversimplification or deception. These ethical norms are not merely standards for evaluating analysis that has already been undertaken and presented. Rather, these norms provide essential guidance to analysts throughout the entire analytical process, as they decide what to analyze, how to write up their findings, and how to present them.

While these guidelines are straightforward, they may weigh heavy on analysts working for advocacy organizations and some government agencies who are being told to produce reports that, well, argue a position. At issue here are practices that include intentionally improper science, the intentional omission of evidence, facts that are represented in misleading ways, and argumentation

against facts. Where evidence-based policy is said to be pursued, the quality of the evidence is poor and suspect. Credible, leading advocacy organizations recognize the value of being truthful and objective, and often pursue analysis and research in ways that provide deeper understanding related to their policy goals and which stand the test of scientific scrutiny. The clash of ideas and policies is proper in any democracy, and it is best conducted with evidence that does not add liability by jeopardizing one's credibility.

Third, in recent years considerable attention has been given to the impact of research on the ***well-being of human subjects*** in research. Some key ethical principles in research involving people are that their participation should be voluntary and based on informed consent (that is, they should know what they are getting involved in), that information about them should be held confidentially, and that risks of harm to subjects should be minimized and reasonable in relationship to anticipated benefits. Concerns about the well-being of human subjects arose from various medical research experiments that intentionally misled patients and exposed them to great harm.

Some landmark examples of scientific misconduct involving humans in medicine include the Nazi war crimes during World War II, in which concentration camp prisoners were subjected to torture and poisonous injections to see how they would be affected. In the United States, the Tuskegee syphilis study (1930–1972) used as its subjects several hundred black males with untreated syphilis, without informed consent. Even after penicillin was found to be an effective antibiotic treatment in the 1940s, these black males were neither informed about nor offered treatment choices. In the Willowbrook study, 1963–1966, newly admitted children with mental handicaps were injected with hepatitis in order to track the natural history of the disease. Parents had to approve of the treatment, but approval was also necessary as a condition for admission into this overcrowded facility.

Regrettably, these cases do not stand alone. Instances of deceit and coercion, whether subtle or blatant, led to the development of the ethical principles described earlier. There are many other examples of research misconduct, too. For example, in one case, public health workers lost a confidential file of known AIDS patients that was later sold in a local nightclub. Most human subjects research is now overseen by institutional review boards (IRBs) to ensure that risks to subjects are reasonable and that possible harm is identified and minimized. These boards are committees at universities and other research institutions composed of scientists who evaluate the protocols of proposed research. The point is that we confront ethical issues in research pretty much every time we do research, and we need to learn from past errors. For example, what ethical issues are involved in the push to have the U.S. Food and Drug Administration approve some drugs early, before they have been fully tested? The notions of research not causing unnecessary harm and being upfront with

participants are now fully established ethical principles. If analysis involves access to confidential data, then steps must be taken to ensure that these data are protected. The impact of research on human subjects must be considered and steps undertaken to minimize and address harmful impacts. Managers also need to be mindful of the negative impacts that their analysis can have. The interest of affected parties should be considered, for example, by ensuring that conclusions are accurate and fair. Table 1.1 provides an overview of important ethical principles.[6]

Table 1.1 Ethics in Research and Analysis

Be honest:

1. Do not hide facts, change data, falsify results, or use only data that support your conclusion.
2. Present results in straightforward and nonmisleading ways. For example, do not adjust scales to give the appearance of a significant increase when the increase is minor or insignificant. Also, do not suggest a level of precision that is not present.

Be complete:

3. Report all data and results that relate to a conclusion, not just those that support it.
4. Identify caveats and alternative explanations that may qualify your findings, even if no data exist to evaluate these caveats or alternative explanations.
5. Report the sources of your data, data collection methodologies, possible gaps and shortfalls, and impact on findings.
6. Be thorough, meticulous, and objective in your analysis, conclusions, and communications.

Be useful:

7. Try to produce information that can help your employer, other stakeholders, and the public interest.
8. Communicate information and results in ways that nonexperts can readily understand.

Be mindful:

9. Information is power; be aware of possible negative consequences. Address possible negative consequences of your analysis by considering further analysis, by considering the interests of affected parties, and by identifying relevant caveats in findings.
10. Respect the interests of human subjects whose data are being analyzed. They may have rights to privacy and "hold harmless" clauses. Obey research protocols.

SUMMARY

Analysis and data are commonly used by public and nonprofit managers to support decisions. Analysis is useful because it helps provide an objective, factual underpinning to situations and programs and helps quantify the extent of problems and solutions. Analysis grounded in research methods provides a rigorous way of understanding policies and programs, and about asking certain questions about them. At the very least, a focus on facts and objective analysis can help reduce judgment errors that stem from impressionistic or subjective perceptions. Analysis and data often are used to describe problems, programs, and policies; to assist in monitoring programs and in making decisions that might make them more effective or efficient; and to evaluate outcomes.

The effective use of analysis and data requires competency in the following areas: knowing existing data sources, their applications, and their limitations; having an ability to gather one's own data; having an ability to analyze data; being able to communicate findings; being able to guide analysis by the specific, substantive program and policy interests; and being aware of ethics practices. Managers who seek to increase their competency often experience different stages of proficiency: "know-nothing," journeyman, technocrat, and the sophisticated expert.

The effectiveness of data and analysis in decision making depends on more than just technical competency; it also depends on the ethical integrity with which research is performed. Areas of ethical concern involve the integrity of the research purpose, the integrity of its analysis and communication, and the integrity of dealing with human subjects. Analysis in public and nonprofit organizations often serves dual purposes, namely, to promote programs and policies and to establish factual, objective truths that meet standards of scientific evidence. Analysis should be forthcoming about the purposes that it serves and about the ways in which these purposes have affected.

KEY TERMS

Notes

1. See https://naspaaaccreditation.files.wordpress.com/2015/02/naspaa-accreditation-standards.pdf (Standard 5.1). See also http://accreditation.naspaa.org/ for general information about NASPAA.
2. Adam Douglas Henry, "The Challenge of Statistics Education in Master of Public Administration Programs: A Review of Two Popular Textbooks," *Journal of Public Administration Research and Theory* 24 (2104): 235–43.
3. United Nations Department of Economic and Social Affairs and International Association of Schools and Institutes of Administration, Task Force on Standards of Excellence for Public Administration Education and Training. (May 2008). *Standards of Excellence for Public Administration Education and Training*. Retrieved from http://www.iias-iisa.org/iasia/wp-content/uploads/Standards-of-Excellence-English.pdf.
4. http://www.eapaa.eu/wp-content/uploads/2015/04/EAPAASE GuidelinesVersion7Jan2013.pdf. Having said this, programs in Europe are thought to emphasize less quantitative and managerial ability in favor of greater critical analysis and policy writing.
5. To learn more about salaries in public and nonprofit administration, take a thorough look at salaries at the Bureau of Labor Statistics "Occupational Employment Statistics" website, www.bls.gov/oes/current/oessrci.htm. For government, scroll down and select sector 99. For nonprofits, select NAICS 712100, museums, or select NAICS 813300, social advocacy organizations, and then the subgroup community and social service occupations. For an interesting look at careers, visit www.naspaa.org/students/careers/careers.asp. This site also offers salary information.
6. Table 1.1 deals with ***ethics in research*** and data analysis, but it is also useful to consider codes of professional conduct generally. Most professional organizations have such codes, such as the American Society for Public Administration (www.aspanet.org) and the International City/County Management Association (www.icma.org).

Research Methods

This section examines research methods and their application to public and nonprofit management and policy analysis. ***Research methodology*** is the science of methods for investigating phenomena, and research methods are used in virtually every social science discipline. Research methods offer managers and analysts an approach and language for understanding their world, for relating seemingly disparate phenomena. It helps with developing specific skills related to the competencies described in Chapter 1, such as evaluating program or policy outcomes, or conducting a client needs or employee satisfaction survey, for example. The chapters in this section provide an in-depth examination of the research methods that managers and analysts use to gather, analyze, and communicate facts and findings in their lines of work.

In this brief introduction, we offer a few important distinctions that shape a useful perspective to what follows. First, research methods are not unique to public administration or policy analysis, and problems to which they are put give rise to specific applications. Here, we examine important problems that managers and analysts commonly face: (1) assessing conditions or problems in policy domains and communities, (2) evaluating the past performance of programs and policies, (3) managing and monitoring the present performance of programs and policies, and (4) forecasting future programs, policies, and community

conditions. Different fields have different contexts that shape the application of research methods (for example, surveys of communities are very different from those used in business or psychology).

Second, research begins with asking questions, and it is common to distinguish between basic and applied research that have different purposes and, hence, questions. The purpose of ***basic research*** is to develop new knowledge about phenomena such as problems, events, programs, or policies, and their relationships. Here are some basic research questions in public and nonprofit management: What is the nature of tax avoidance? Why do people care about the environment? In what ways do citizens volunteer their time, and what causes them to do so? What are the activities and outcomes of some programs or policies, such as to increase home ownership? And why do some people have an aversion to statistics? These questions clarify the nature and relationships among phenomena by asking, generally, "What is this, what causes it, and/or what consequences does it have?" Many academic research projects are of this nature, and the question can be asked with regard to past, present, or future events.

The purpose of ***applied research*** is used to solve practical problems. Examples of applied research questions include the following: What can governments do to reduce citizen apathy? How can governments increase the use of certain programs? What can be done to minimize the impact of turnover among political appointees on program quality? What can be done to increase students' interest in statistics? These questions clearly have practical matters in mind. They often ask, "How can this be done or improved?" While policy leaders are often motivated by applied questions, managers and analysts often encounter both basic and applied questions in their work. Indeed, finding out how something can be improved implies knowing something about it, and both basic and applied research can give insight into factors shaping phenomena, though applied research is more likely to focus more on factors of interest to policy makers. Both kinds of questions are important to managers and analysts, and learning to ask them in ways that are answerable is a useful purpose of this course.

Third, managers and analysts must choose among a broad range of research methods to answer their questions. Research methods often are classified as being either quantitative or qualitative in nature. ***Quantitative research methods*** involve the collection of data that can be analyzed using statistical methods. Such data typically are collected through surveys and administrative records, and they produce numbers used to describe (that is, to measure) the extent of societal problems (such as teenage violence or homelessness, for example), to monitor program operations, to determine program efficiency and effectiveness and to analyze by how much they can be improved, and to evaluate the impact of programs.

Qualitative research methods refer to the collection and analysis of words, symbols, or artifacts that are largely nonstatistical in nature. Such data often are

collected through interviews, focus groups, and direct observation. Typically 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 to stakeholders, often in their own words. Though words and symbols can be counted, the point is to provide a detailed and contextualized understanding that provides new insight. It is also used to describe programs and policies, including processes through which programs and policies affect outcomes, and can include suggestions for improving programs.

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 quantifiable information about problems and phenomena, nor can it offer conclusive, statistical proof about the impacts of programs and policies. Hence, research in public management and policy analysis typically uses both quantitative and qualitative research methods. Simply, both have their place and are needed.

Managers and analysts need a working familiarity with a range of basic and applied, quantitative and qualitative research methods, and the chapters in this section provide a diversity of purposes and methods. Chapter 2 introduces basic concepts of research and applies these concepts to program evaluation. Managers and analysts are often called upon to demonstrate the outcomes of public and nonprofit programs and policies. Program evaluation is an important approach to accountability. Program evaluation demonstrates the use of both basic and applied research, and the need for both qualitative and quantitative research methods. The chapter introduces experimental and quasi-experimental designs for evaluating programs and gives examples.

Chapter 3 addresses the problems of conceptualization and measurement. Many concepts in public policy and administration are highly abstract, such as democracy, apathy, safety, self-sufficiency, environmental consciousness, economic well-being, and so on. The chapter discusses the problem of conceptualization, measurement validity, and the importance of measurement scales and levels.

Chapter 4 describes additional research methods for public managers and analysts. It deals with research on problems that involve the present (monitoring) and the future (forecasting). Specifically, it discusses performance measurement, which is increasingly used for program monitoring and to provide accountability. The chapter also applies criteria of validity, developed in Chapter 3, to the measures of performance measurement.

Chapter 5 looks at data collection methods. An important competency for analysts and managers is familiarity with the data sources in their lines of work.

This chapter discusses uses and challenges of secondary data, administrative data, and survey data. It provides guidelines for conducting surveys, including sampling strategies and methods, and also notes the roles of qualitative data, such as interviews and focus groups that are useful for assessing community conditions—the starting point for program and policy formulation.

Lastly, the workbook that accompanies this textbook includes many additional examples of the research methods and data collection strategies discussed in this chapter. Because public and nonprofit management draws on a multitude of fields, and public managers must work with professionals in different fields, analogous terms and concepts are clearly identified through the book. This book includes footnotes that serve a variety of purposes, such as providing additional clarification and examples that readers may find useful.

Research Design

CHAPTER OBJECTIVES

After reading this chapter, you should be able to

- Distinguish between independent and dependent variables
- Explain the role of theory
- Describe the six steps of program evaluation
- Understand the importance of rival hypotheses
- Explain experimental and quasi-experimental designs

This chapter introduces major concepts in social science research and applies them to program evaluation. Program evaluation, which helps managers and analysts to determine the outcomes of programs and policies, is an important and necessary skill for managers and analysts to have. This chapter also examines a variety of research designs commonly used in program evaluation.

INTRODUCING VARIABLES AND THEIR RELATIONSHIPS

Variables. Research is about establishing the nature of things. For example, assume that we are responsible for managing a program to reduce high school violence or that we are otherwise interested in this topic. One of the first steps that we need to take is to gain a solid understanding of this phenomenon, high

school violence, by examining the ways in which it is manifested. We would want to know about its various forms such as verbal and emotional abuse; its physical manifestations such as shoving, hitting, and the use of weapons; and its racial and sexual manifestations, too. Thereafter, we would want to know the magnitude of each manifestation, such as how many fist fights, gun fights, or rapes occur. And we might want statistics on specific types of injuries, such as broken bones or concussions. Indeed, the frequency of these phenomena often is a key target for management and public policy.

The same is true for many other phenomena such as community conditions (for example, poverty or economic growth), events (such as wildfires or toxic spills), as well as the impacts of programs and policies (say, to increase the competitiveness of students or reduce the prevalence of certain diseases). We will want to first establish the manifestations of a phenomenon and then learn something about their magnitude. If we are interested in environmental quality, for example, we will want to know facts about the state of the environment and how it varies in different ways and in different locations. If we are in health care management, we will want to know the incidence of different diseases. If we are interested in inflation, we will want to know its current level, which factors such as energy prices or housing costs are responsible for recent changes, and how inflation varies in different parts of the country. Once we decide what we are interested in, we will want to know more about its manifestations and variations, and the ways in which policies or programs affect it.

Public and nonprofit management and policy typically involve phenomena that vary in some way. ***Variables*** are defined as empirically observable phenomena that vary. This is best illustrated by a few examples. "High school violence" is a variable because it is observable and varies across schools; violence is more common in some schools than in others, and we can observe the differences. "Environmental quality" is also a variable because it is observable and varies across locales, as do "diseases" and "inflation," for example. Variables are key to research, and they are everywhere. The number of students in classes is also a variable because different classes have different numbers of students, and the number of students in each class can be observed. By contrast, in a study of only female students, "gender" does not vary and is therefore called a ***constant***. Constants are phenomena that do not vary.

Getting Started

Can you identify important variables in your present or future line of work, such as services or program outcomes, that vary in some way?

Attributes are defined as the specific characteristics of a variable, that is, the specific ways in which a variable can vary. All variables have attributes. For example, high school violence can be measured as being absent, sporadic, occurring from time to time, or ongoing—these are the attributes of the variable "high school violence." Another example is the variable "gender." Gender varies

in the population, and the attributes of gender are "male" and "female." The variable "race" often has more than two attributes (Caucasian, African American, Native American, and so forth). The variable "income" can have few or a nearly infinite number of attributes if income is measured as specific dollar amounts. In surveys, often each survey item is treated as a separate variable, and the response categories for each question are the variable's attributes. For example, the question "What is your gender?" is considered a variable, and the response categories "male" and "female" are its attributes.

Research usually involves ***descriptive analysis*** that provides information about the nature of variables—such as whether a high school violence problem exists and the extent or level of it. The preceding discussion gave examples of descriptive analysis. In our high school violence example, descriptive analysis can be used to show the nature of the perpetrators, the geographic areas in which such violence most often occurs, and the extent to which it is perceived as a problem. Descriptive analysis is useful in public management and policy because managers need to know the state of the world that they are trying to shape. They need to know, for example, the number of teenagers who have been hurt by others at school. This is simply a number—such as 5 percent.

Relationships. Research usually also involves the study of *relationships* among variables. Managers and analysts want to know the causes of problems and the effectiveness of interventions. This involves examining ***relationships***, that is, specifying which variables are related to each other, and the ways in which they are related. For example, we might want to examine whether students who participate in anger management classes describe themselves as being less angry or less prone to acting out against others. Specifically, we want to know whether participation in anger management class decreases the extent of acting out by students. We might also examine the effect of other conditions—such as drug use or gang participation—on high school violence. By knowing how programs and conditions affect outcomes, managers can better recommend and pursue alternative courses of action. In short, most studies involve both descriptive analysis and an examination of relationships.

Relationships in social science are distinguished by whether they are probabilistic (occurring sometimes) or deterministic (occurring each time). For example, when we say that anger management reduces high school violence, we are not implying that this always occurs, for each student. Some students might even become more violent, perhaps learning new ways of expressing their anger. Rather, we mean that, *on average*, the number of violent incidents will decrease. The number of incidents will decrease for some students more than for others, and for still others it will not decrease at all; the relationship is probabilistic in nature. Social scientists have standards for them, such as anger management reducing high school violence in at least 95 out of 100 times, or even in 99 out of 100 times. By adopting such standards, social scientists provide information

about probabilistic relationships with a relatively high degree of confidence.[1] Many relationships in the social world are *probabilistic* in nature.

Relationships are further distinguished as being either *causal* or *associational*. ***Causal relationships*** show cause and effect, such as the impact of anger management programs on high school violence, the impact of employee compensation on workplace productivity, or the impact of environmental policies on water quality. In these instances, one variable is assumed to affect another. By contrast, ***associations*** are relationships that imply no cause and effect. For example, it is said that in Sweden a relationship exists between the number of storks and the number of childbirths; both increase in the spring. Does this imply that storks really do bring babies, at least in Sweden? No, of course it doesn't. The appearances of storks and new babies are unrelated; they have no cause-and-effect relationship.[2]

Getting Started

Can you identify examples of causal relationships and associations in your area of interest?

Among causal relationships, we further distinguish between *independent variables* and *dependent variables*. ***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). For example, in a study of the impact of anger management on high school violence, anger management is the independent variable that affects high school violence, which is the dependent variable. Causal relationships are commonly thought of in the following manner:

Independent Variable(s) → *Dependent Variable*

An important step in any research is specifying the dependent and independent variables. Doing so brings clarity and direction to the research. Although many studies examine several relationships, most evaluations focus on explaining only a few dependent variables. In our example, we wish to examine the impact of anger management on high school violence:

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

Of course, our evaluation needn't be limited to studying just this relationship, but specifying relationships in this manner helps concentrate our attention on (1) accurately determining the level of high school violence and (2) examining whether anger management is associated with it. We might also study the effect of gun control laws (independent variable) on this dependent variable, or other relationships such as the effect of homework assistance

(independent variable) on academic performance (dependent variable). Distinguishing between independent and dependent variables is a cornerstone of research, program evaluation, and policy analysis; it is essential to clarifying and sharpening one's thinking and fundamental to communicating to others about what is being studied. *Distinguishing between independent and dependent variables is an essential skill that managers and analysts will want to practice.*

Key Point

Distinguishing between independent and dependent variables is an essential skill.

Moreover, research is often intended to stake a claim of *causation*. In our example, managers will surely want to argue that anger management has caused the decline in high school violence. You may have heard the expression "correlation does not prove causation." This is true. Causation requires both (1) *empirical (that is, statistical) correlation* and (2) *a plausible cause-and-effect argument*. These two ***criteria for causality*** must be present. 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. Regarding the impact of anger management on high school violence, a plausible theory might readily be written up. Anger management training teaches people how to identify anger and release it in ways that are nonviolent toward others (including, for example, increased motivation and proclivity to apply what is taught to reduce feelings of anger and apply new behaviors when experiencing anger). Thus, both statistical correlation and a persuasive theoretical argument are required to stake a claim of causation. (The footnote includes additional criteria specifying aspects of empirical correlation and theory.)[3]

How difficult can it be to make a theoretical argument of cause and effect? Examining, say, the relationship between gender and high school violence, we have yet to make a plausible cause-and-effect argument. If we lack specific evidence (especially that might persuade a skeptical audience) that gender, defined by reproductive organs and hormones, causes violence, then we best regard this relationship as a mere correlation, that is, an association, which, too, may be useful to know about. Empirical correlations remain mere associations until analysts have argued, in persuasive and exacting detail, how one variable can plausibly cause another.

It might be noted that while we use the term *theory* as synonymous with making a logical argument, more generally, a theory is a set of logical statements that provide an explanatory framework (e.g., to explain why people buy insurance), often using fundamental principles of behaviors (e.g., people are utility maximizers) and factors (e.g., neighborhood safety). Sometimes, fundamental principles of behaviors or a distinct set of logically coherent thought patterns are also called a theory (e.g., theory of utility maximization). Looking at things from a few different angles or theories is usually a healthy exercise as

you want a framework that helps explain your phenomena in a range of helpful and instrumental ways (e.g., applying different perspectives on motivation might suggest additional independent variables). A literature review of scholarly (research) and professional articles can often help identify and clarify one's thinking about independent and dependent variables. The above text on anger management training shows a beginning of theory development, of arguing how A causes B (or A → B). A key point is that theories are logical constructions, and as such can basically only be judged as being logically sound, flawed, or lacking (incomplete); while everyday language also includes the expression "this theory is false," this usually refers to specific empirical behavior, in a specific setting, being inconsistent with the logical expectations set forth by a theory.[4]

Lastly, a ***hypothesis*** is a logical proposition that has yet to be empirically tested. For example, a study hypothesis might be that "truancy is associated with high school violence in Johnsonville" (i.e., A → B *in a specific setting*). Many (if not most) hypotheses involve causal arguments (why do we expect A → B?), but some hypotheses are expressed as associations, only ("women commit less violence than men in Johnsonville high schools"). Typically, study questions or policy concerns are broad and involve a number of specific hypotheses; each is precisely, and often narrowly, stated in order to allow precise and persuasive empirical testing. A good practice is to make a list of the most important hypotheses to be tested (there are so many relationships that could be studied!), and then ensure that one's list of hypotheses has a high degree of relevance to policy makers or stakeholders. Then, empirical data will need to be collected and analyzed in order to prove various hypotheses either *true* or *false* for the population from which these data are drawn. Subsequent chapters in this book discuss how to analyze data and draw conclusions about hypotheses. Academic research studies are usually quite explicit about which hypotheses are being tested.

Getting Started

Look around you—select a relationship and identify the independent and dependent variables in it.

This brief introduction lays out important concepts that are used over and over again in research. Quite simply, when we do research, we see the world as existing of variables and their relationships.

PROGRAM EVALUATION

Program evaluation can be defined as the use of social science research methods to determine whether, and in what ways, a program works. Program evaluation involves the description of programs, conditions, and events, as well as the analysis of relationships, such as the impact of programs on outcomes. Program evaluation uses both quantitative and qualitative methods to describe programs and analyze their relationships. While we focus here on programs, many of the same considerations also apply to policies.

How difficult can it be to document program or policy outcomes? There usually is more to program evaluation than meets the eye. Among the first challenges is to find out what a program or policy is expected to accomplish. Consider the following example. In response to growing concerns about teen violence, many communities and states have created after-school programs. The idea, according to elected officials and supported by the public, is to get teenagers off the streets and into supervised environments. As a public manager, your job is to implement such a program. Funding guidelines require that you document the success of the program.

Now, you must figure out what the program is expected to accomplish. You might be surprised to learn that sometimes little thought has gone into identifying specific outcomes for such programs, or that some elected officials and experts have different views. Some advocates only want teenagers off the streets, but others expect them to learn something as well. Still others feel that anger management should be taught. Even if you are responsible only for program evaluation, oftentimes you will find yourself formulating program outcomes.

Next, assume that you and others agree that anger management is one of several appropriate activities for the after-school program. Specifically, the after-school program will teach students to recognize and deal with anger in appropriate ways. You might even try to target so-called high-risk students. How will you measure the success of your anger management efforts? Should you ask students whether they feel less angry? Should you ask their parents and teachers as well? Should you ask teachers to record the number of classroom incidents, such as student outbursts? Should you do all of this? If so, in what way?

Suppose you decide to ask teachers to track classroom incidents. Which incidents should be tracked? Is it appropriate to compare different classroom incidents across schools or classes? Should you develop baseline data, and if so, which? Also, how accurate do you think the teachers will be in their reporting and tracking? Are their responses likely to be biased in any way? Or suppose you decide to send a survey to parents. Do you need to send your survey to all parents? How many questions should you ask? What response rate is appropriate? How do you avoid biased questions?

Finally, consider the possibility that the number of classroom incidents drops during the course of your anger management program. How do you know that the drop is due to the anger management course? Could teachers and parents have become more involved in anger management themselves? What if some students who are known to be angry and violent were transferred out of the school? In short, how sure can you be that any changes are due to the after-school program?

These questions are hardly academic. Elected officials and senior managers expect others to have answers to such questions, regardless of whether they

Getting Started

Select a program in your area of interest (or workplace) for possible evaluation. Which relationship(s) would you focus on?

concern after-school programs, prison overcrowding, environmental protection, or national security. Determining which outcomes ought to be measured and measuring their attainment in credible ways are activities germane to all public programs and policies. Public departments need people with skills to assess program outcomes; program evaluation applies social science methods to these issues.[5]

Six Steps

Program evaluation usually involves six steps. The purpose of these steps is to help researchers and managers identify and address relevant concerns in an orderly manner. These steps help ensure that evaluation is done in objective and scientifically valid ways—evaluation findings must be credible and stand up under the light of public scrutiny—and that conclusions and recommendations are embraced by those who have the power to bring about change. Program evaluation must include opportunities for stakeholders to have input; study conclusions must be credible, relevant, and consistent with opportunities for change. The following ***six steps of program evaluation*** provide a strategic roadmap that combines these dual needs—to be both responsive and objective:

1. *Define the activity and goals that are to be evaluated.* What are the key objectives and constraints according to key decision makers? What are the main objectives and concerns according to program staff? How do clients and others outside the program view it? What is the key target population of these activities and goals?
2. *Identify which key relationships will be studied.* Which program outcomes does the evaluation measure? Which factors are hypothesized to affect these program outcomes? Which counter-explanations are considered?
3. *Determine the research design that will be used.* Will a control or comparison group be used? Is there a need for developing a baseline of current performance? Are periodic or follow-up measurements foreseen and, if so, over what time period?
4. *Define and measure study concepts.* Which study concepts require detail in measurement? Which concepts require little detail? Will existing data be used, and how accurate are they? Will new data be gathered through, for example, a survey or focus group? If so, who will undertake such a project, and how long will it take? What statistical requirements must the data meet for subsequent analysis? What resources and expertise are needed for data collection and program evaluation? What suggestions do key decision makers and others have for improving measurement?

5. *Collect and analyze the data.* Which statistical techniques will be used for data analysis? What type of conclusions are researchers seeking from the data? Do the data meet the requirements of different statistical techniques?
6. *Present study findings.* How, and to whom, will conclusions be presented? Can presentations be part of other consensus and decision-making processes? Can preliminary feedback about tentative findings be obtained from key decision makers and others? Who requires a detailed analysis and presentation? Who requires only a brief overview of main findings? What should the final report look like, and to whom should it be sent?

Previously we dealt with some matters pertaining to the first two steps. In our example, the activity is the after-school program of anger management which teaches students to recognize and deal with their anger. We might further specify that the program targets high-risk students, or, after further interviewing school administrators, teachers, and students and their parents, additional program objectives are identified such as also keeping students safe after school, improving academic performance, reducing disruptive behavior both in classrooms and outside school, and even providing opportunities for getting involved in other activities such as sports. Regarding the second step, while participation in anger management is examined for its impact on the specified outcomes, other factors might play a role, too. For example, gang participation and drug use are likely to reduce the effect of anger management training as a result of strong countervailing peer pressures and addictive impulses, while being transferred to a low-violence school might reduce violence. Program evaluation typically takes into account a range of circumstances that impact program outcomes.

While we have thus far focused on programs, the same steps also apply to policy evaluation. Policy evaluation is typically less concerned with policy definition (often a given), and more with ascertaining which intended and unintended outcomes in fact occurred, and what factors (e.g., programs or human behavior) shaped these, including any implementation issues. In our example, if the policy objective is to reduce high school violence, several policies might be considered, such as funding anger management training courses for high-risk students or adopting strict "no violence" policies. Policy analysts will formulate theories about how these policies could affect high school violence and evaluate whether these policies are in fact associated with changes in high school violence. No doubt, policy analysts will also want to know how factors such as local conditions or human behavior affect these relationships as well. Thus, whether from a hands-on perspective of a local administrator shaping a program intervention, or that of a state or federal policy analyst studying a policy, the above steps are helpful. Consider how the above steps apply to your program or policy evaluation, and be sure to specify your dependent and independent variables.

Finally, as a practical matter, it often is useful to expand evaluation studies by including matters that may affect subsequent stakeholder decision making, too. For example, decision makers may want to know the availability of after-school care by parents, knowledge and use of the school counselor, and the perceived usefulness of additional academic programs. If a survey is used as part of program evaluation (see Chapter 5), then such items can readily be added. Including stakeholders in the development of evaluation studies sharpens analysts' knowledge of salient issues and can add buy-in from stakeholders for use of subsequent results.

Rival Hypotheses and Limitations of Experimental Study Designs

The purpose of research design is to help ascertain that outcomes, such as reduced high school violence, are occurring and plausibly related to the program and not to other factors. But what if, parallel to anger management, another program aimed to reduce student access to weapons? Disallowing weapons in school (for example, by using a metal detector at the school entrance to check for them) is a concomitant activity that might also reduce high school violence. Real life surely has many things going on at the same time. The possibility of effects from other factors requires researchers to consider (and determine) the extent to which a change in the dependent variable is indeed caused by the independent variable under study (here, anger management). Studies usually consider multiple factors affecting their dependent variables, which strengthens study conclusions about relationships among key variables.

Alternative explanations for observed outcomes are called ***rival hypotheses***, and variables used to measure rival hypotheses are called ***control variables***. Control variables are empirical, just as dependent and independent variables are, but they get their name from their research role: to test whether relationships between independent and dependent variables hold up under the presence of alternative, rival explanations for the observed pattern of outcomes. They are sometimes also called confounding variables, referring to concomitant activities that also explain outcomes and, hence, complicate efforts to establish a causal effect of programs or policies on outcomes. In our example, the presence of a weapons access policy, a concomitant event, is certainly a control variable that the manager will want to take into account. Indeed, the credibility of study conclusions often rests on the extent that pertinent control variables have been included in the research.[6]

Rival hypotheses (and their associated control variables) can be dealt with through (1) experimental design and (2) statistical control. ***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 intervention. You may be familiar with control groups through literature that describes the effectiveness of medical treatments. In ***classic,***