RESEARCH METHODS IN PRACTICE

THIRD EDITION

For my husband, Howard, thank you for everything, and to my father, who taught me analytical thinking from an early age (DKR)

For Ada, Alina, and Lucia, my best buddies in life, and to my parents, who each in their own way made me a researcher (GGVR)

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RESEARCH METHODS IN PRACTICE

STRATEGIES FOR DESCRIPTION AND CAUSATION

THIRD EDITION

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PREFACE

This book began on a Saturday morning in the spring of 2004, when Dahlia came to visit one of Gregg's executive master of public administration classes. It was a chance simply to observe, get feedback, and share ideas about how to teach research methods. We had each taught this kind of course for years in different programs, but this opportunity arose because we were about to become members of the same faculty in the fall.

We are rather different from each other. Dahlia is an economist with a keen interest in economic theory and causal research. Gregg is a psychologist by training with a background in survey research and program evaluation. Dahlia works on issues related to health care and more recently poverty measurement. Gregg works on issues related to public administration and people's attitudes toward government. Our teaching and writing styles—even our personalities—are quite different.

But we hit it off immediately. We realized that our differences in training and experience complemented and reinforced each other. We discovered that we both had a deep commitment to trying to teach research methods well—with clarity, rigor, and purpose. We shared a strong belief that research methods matter—not just to those who plan to become researchers but to decision makers and practitioners preparing to tackle some of society's toughest problems. We also shared a belief in the value of interdisciplinary research. And we were both increasingly disappointed in the books available to assign to our students.

The standard research methods books we were using had an academic social science flavor, yet our students came from diverse fields and had more policy- and practice-related interests. We wanted a more interdisciplinary approach and more examples of applied social and policy research across various substantive areas (such as public management, education, criminal justice, public health, urban planning, social work, and other areas).

Some of the standard textbooks also seemed to be missing important new developments. Research methods and statistics have advanced very rapidly over the past few decades—not only technologically but intellectually—with important influences coming from economics, psychology, political science, epidemiology, statistics, and various other disciplines. We wanted a book that better reflected current thinking.

We also found that the books we were using did not cover causation sufficiently—despite the fact that causal research is essential to understanding the origins of social problems and the effectiveness of proposed solutions. When books did discuss causation, they focused heavily on experiments rather than the observational studies (with control variables or matching), quasi experiments, and natural experiments that modern social and policy researchers mostly depend on to examine causal questions in the real world. We wanted a book that would help students think seriously about causation and recognize and assess the actual research strategies used most often to try to get at it.

Many books describe the abstract concepts of the scientific method and the technicalities of specific methods, but we wanted a book that also gave a feel for the realistic

trade-offs, uncertainties, habits, and also excitement that constitute the research experience. To do so, the book we envisioned would contain plenty of in-depth, real-world examples of a wide range of studies that would serve not only to illustrate key methods and ideas but also to demonstrate the value of research to public policy and practice. Research is not perfect—often far from it. Still, we believe that it provides one of the best tools we have for fixing many of society's most pressing problems.

Finally, we also wanted a book that worked for our diverse students, who differ tremendously in their quantitative and research backgrounds—and vary a great deal in what they want to use research for. Some students already have experience doing research, while others have no prior knowledge at all. Some students have backgrounds in quantitative fields like engineering or finance, while others have backgrounds in humanistic fields like history or the arts. Yet all of our students—indeed, we would argue all practitioners and even all citizens—face a deluge of research, analysis, and statistics and must learn to interpret findings, recognize misrepresentations, and make judgments about the strength and relevance of the evidence.

One of the challenges in writing about research methods for such a diverse audience is whether and how to introduce some of the more advanced or technical topics. Rather than leave out important topics, we decided to provide conceptual introductions, avoiding the technical details and emphasizing a more intuitive approach. This way, readers would be able to recognize such techniques when used in studies, and those learning to do their own research would have some initial ideas about the aims and possible applications of more advanced techniques. That is just one of the ways we tried to design a book that will be useful for our readers for years to come as they develop in their careers.

By the end of that morning (probably it was the early afternoon by the time we finished our coffee and discussion), we decided to begin writing our own research methods textbook. We started gradually, using a few draft chapters as supplements to the standard textbooks we were using. As we wrote and taught with our emerging book, we found new ways to explain key ideas, experimented with the best order of topics, dug up interesting examples, and worked to clarify and simplify the often confusing terminology of research methods. As the full book took shape, we had many discussions and debates about ideas and worked long hours revising and rearranging the chapters into a logical, clear, and coherent whole.

We have been extremely gratified by the positive reactions—from students, instructors, and independent readers—to the prior editions. Perhaps most gratifying is to discover that those who appreciate our book seem to range so widely in their fields of interest and especially their backgrounds, from experienced researchers to students just starting their training in—and perhaps a little fearful of—research methods.

We both learned a tremendous amount in the process of writing this book and in making revisions for this new edition. We hope that the book helps students and others learn a great deal as well.

How the Book Is Organized—and Why

We organized the book broadly around what we see as the two main kinds of research: strategies for description (Chapters 4 to 7) and strategies to get at causation (Chapters 11 to 15). Descriptive research questions ask about *what is*—the characteristics and patterns that exist in the social world. Causal research questions ask about *what if*—how things in the social world would be different if we made a change. Both are essential in most basic

and applied fields, yet it is critical to recognize this distinction when doing or assessing studies (and not, for example, assume that a descriptive study demonstrates causation).

Before getting into the details of descriptive and causal research, we present some foundational concepts and tools (Chapters 1 to 3). These include the nature of research and of the scientific method and, importantly, the foundational role of theory, the tool of causal diagrams, and core concepts (such as variables and relationships) that appear in almost all forms of research. We also cover qualitative research (Chapter 3) as foundational because it often serves as an exploratory method and because it helps generate theory and identify causal processes. Introducing qualitative methods early also allows later, more quantitative chapters to incorporate and integrate the qualitative perspective so that we can present more of a mixed-methods approach to most topics.

Although we kept the order of topics fairly traditional, similar to that of other research methods books and courses, we have situated some chapters differently and introduced novel ones. We put the chapter on qualitative research early in the book for the reasons just mentioned. We cover sources of secondary data (Chapter 6) before primary data (Chapter 7) because many students will work mostly with secondary data (both in their classes and in their careers) and because of the burgeoning availability of secondary data.

We placed the chapters on statistical analysis (Chapters 8 to 10) between Part II (Strategies for Description) and Part IV (Strategies for Causation) because the tools of statistical analysis (including statistical inference) are largely descriptive—statistics alone do not establish causation—and because certain statistical tools are needed for some of the most widely used strategies for causation (such as control variables). We have given the statistical analysis chapters their own part (III) also to emphasize that they are tools that can be used for many purposes, separate from the conceptual and methodological issues covered in other parts of the book—and to give readers and instructors flexibility in how much statistics to delve into. For those with a background or recent course work in statistics, Part III can be used for review or even skipped entirely. For those needing to learn statistics along with research methods, the chapters of Part III provide a choice of learning levels from basic data analysis and interpretation (Chapter 8) to statistical inference (Chapter 9) and more advanced multivariate techniques (Chapter 10). Although we envision most readers as having had at least some prior course work in basic statistics, the book is nonmathematical and written to be accessible to those without prior course work in statistics.

In Part IV on strategies for causation, we have a somewhat novel chapter at the start focused on the issue of causation itself (Chapter 11)—what it is, why it is important, and how to begin identifying it. We have found that probing these questions in depth provides motivation and background for learning the logic and methods of various real-world causal research strategies. Instead of presenting randomized experiments right away, the "gold standard" for determining causation, we first cover observational studies with control variables (Chapter 12, which provides the intuition) and how to implement this strategy using multiple regression (Chapter 13, which provides additional statistical details). We cover observational studies first because they are the most numerous in social and policy research and thus the ones students are most likely to encounter in their studies and in their careers. But more important, understanding the limits of observational studies illuminates the need for and logic of randomized experiments, which are covered next (Chapter 14). Following the chapter on randomized experiments, we have another somewhat novel chapter on natural and quasi experiments (Chapter 15) that covers a variety of

real-world strategies that emulate the advantages of experimental research for answering causal questions. Natural and quasi experiments, along with observational studies, represent the vast majority of research used to inform policy and practice. The order of chapters in Part IV aims to facilitate understanding of these types of studies.

In Part V, we conclude the book with some consideration of the broader context and communication of research, including the politics and production of research, ethical issues and procedures, and some practical advice on finding, reviewing, and communicating research.

We recognize, to be sure, that different instructors and programs have different styles and requirements. Some courses must be completed in just a quarter, for example, while others take place over a semester or even an academic year. So to the extent possible (in a linear medium such as a book), we have tried to allow the chapters to be used in a different order or to be taught in parts. For example, some instructors may wish to combine, or omit, selected chapters, in particular the chapters in Part III on statistics (which may not need to be covered in some courses) or Chapter 13 on using multiple regression to estimate causal effects (which is a bit more statistical). Still, we have put much thought and a good deal of class testing into this book, and so we encourage instructors to at least consider the general logic of presentation suggested by our table of contents.

What's New in the Third Edition?

In the years since the second edition was published, we have continued to gather insights and ideas about how to improve our book, not only from our reviewers and colleagues but also, importantly, from our many students. In classroom discussions, one-on-one interactions, and reading student work, we looked for what confused students—and incrementally honed ways to prevent that confusion. We stored up our knowledge in marked-up second editions, took photos of whiteboards with new examples and diagrams, and wrote down lots and lots of notes.

These insights and improved teaching approaches inspired important changes to the third edition. With some exceptions, they did not take the form of major reorganizations or new top-level sections. More often, they took the form of new short sections, new diagrams, or revised diagrams. Most frequently, they took the form of a clearer term or phrase, a new sentence of explanation, a rewritten paragraph, or reordered paragraphs within a section.

There are too many instances to list, but one example should give a flavor. In randomized experiments (Chapter 14), baseline descriptive statistics (balance) tables and results tables have the same structure and appearance. So students often confuse them. What avoids that confusion—and helps students understand the difference? In response, we now explicitly point out the resemblance between baseline descriptive (balance) tables and results tables, and we compare and contrast their purposes and what to expect when interpreting their contents. In this way, we hope to help students understand not only the chapter but also the published results of experimental studies.

This third edition also reflects advances in applied social research, some, but far from all, driven by technology. We are proud that our first edition (published in 2010) emphasized some methodological advances when they were only being discussed in much more technical venues. For example, our first edition emphasized diagramming common causes, reverse causation, and mechanisms to decide what variables make good or bad control variables. At the time, that content was only seen in more technical or specialized publications. Since then,

the use of causal diagrams has become much more widespread across the social sciences. Our book was also early in emphasizing practical versus statistical significance, an issue that has exploded not only in the social sciences but among science journalists as well. We have continued to refine and update our treatment of these and other advances in the third edition. And we are always on the lookout for new issues and methods at the cutting edge of the social sciences.

While we can't detail all the changes to this third edition, here are some of the highlights:

Part I: Foundations

- Chapter 1 on research in the real world includes a number of updates and new examples that illustrate how research methods matter to policy and practice. We also note some new developments that make knowledge of social research methods increasingly relevant, such as the burgeoning use of analytics to guide decision making in business, government, and nonprofits.
- Chapter 2 on theory, models, and research questions reflects a number of important changes. First, we did away with the "broken windows" theory of policing as the opening example and replaced it with "community policing" instead. But we kept a summary of the broken windows theory in a box for comparison and for consistency with prior editions, and we added another box about the growing controversy over this theory, its relationship to aggressive policing tactics, and some lessons relevant to applied social research. Second, we reorganized and restructured content based on our experiences of how students learn, for example, relocating the ideas of spurious correlation and the ecological fallacy to Chapter 11 (on causation). Third, we revised our discussion of interpretivist and grand theories and how they compare to the middle-range substantive theories we emphasize. Fourth, we now use the term *causal diagram* (rather than *path diagram*) to be more consistent with current causal theory and terminology. Since we return to causal diagrams often in the book, this change appears in subsequent chapters as well (especially Chapters 11 and 12). This chapter has quite a few other changes and additions.
- Chapter 3 on qualitative research has more discussion of social media and other online sources of qualitative data, which have become much more widespread. And we include various updates to qualitative methods and terminology. For example, we added new or revised coverage of virtual focus groups and big data (which is often text or other qualitative data). We also clarified some further topics, including interpretivist approaches and when to conduct focus groups rather than interviews.

Part II: Strategies for Description

- Chapter 4 on measurement includes some important conceptual clarifications and is reorganized, based on our experience teaching these ideas, to help with understanding measurement in the social sciences. For example, we added sample data set excerpts to illustrate types of variables and classical measurement theory. We also added new content on measuring race-ethnicity and gender, which has become an important issue in many government and social surveys.
- Chapter 5 on sampling incorporates a clearer distinction at the outset between representativeness and the broader notion of generalizability. We include some

important updates about online sampling, which is increasingly important but challenging. We added an explanation and illustration of likely voter models and new examples from polling errors in the 2016 and 2020 U.S. presidential elections. And we created a number of new figures that better illustrate various types of complex probability sampling, as well as some updated examples.

- Chapter 6 on secondary data starts with a new opening example—the use of secondary data to track and understand the COVID-19 pandemic. It includes updates to data archives and sources of public use microdata. And the chapter includes new coverage of big data from social media, online transactions, and smart devices.
- Chapter 7 on survey research and other primary data reflects the many changes in the field of survey research, which increasingly relies on online methods. Even the 2020 U.S. Census, which long relied on mail self-administered forms, employed a mixed-mode approach that used mailed forms but encouraged online responding. We also added new content on question ordering and response formats.

Part III: Statistical Tools and Interpretations

- Chapter 8 on descriptive statistics reflects some updates to various data examples, as well as to statistical software. And, importantly, we have added some more structure and new coverage on the interpretation of practical significance and effect size.
- Chapter 9 on statistical inference has fewer changes, overall, although it does include some important refinements as well as new or updated coverage of nonequivalence and noninferiority tests, as well as Bayesian inference.
- Chapter 10 on multivariate statistics has some updates and clarifications, as well as new material on machine learning.

Part IV: Strategies for Causation

- Chapter 11 on causation includes updates to the opening example from new research on family dinners and substance abuse, research that demonstrates the extent of bias in the results. We also added advice on writing about empirical evidence so as to distinguish correlation and causation. Importantly, the chapter now highlights key terms from contemporary causal inference, including direct acyclic graphs (DAGs) and potential outcomes.
- Chapter 12 on observational studies provides more advice on choosing control variables, and it better explains the various purposes of control variables. It incorporates a clarified discussion of matching methods and a reorganized coverage of epidemiological approaches. And it adds coverage of some new topics, such as colliders.
- Chapter 13 on regression analysis of causal effects features two new extended examples: first, the link between residential greenery and birth outcomes and second, the gender gap in earnings. These replace the breastfeeding example in the prior editions. These new examples allow us to explore not only omitted variables bias but also odds ratios, practical significance, and the role of controls

for exogenous independent variables of interest. We also added new and updated material on predicting the direction of bias from omitted variables, propensity scores, and machine learning for causal analysis.

- Chapter 14 on randomized experiments incorporates some new examples, including from lighter-touch (and lower-cost) nudge experiments, as well as advice on how to judge balance. It also presents some new material about generalizing experimental results, variants of randomized experiments, preregistration, and the analysis of experiments.
- Chapter 15 on natural and quasi experiments reflects some rethinking on our part of how to better define these types of studies, including emphasizing the different dimensions that help researchers to find and create exogenous variation for convincing causal studies. It also includes some new and revised examples that better illustrate the key features of such studies.

Part V: Context and Communication

- Chapter 16 on the politics, production, and ethics of research includes some subtle but important qualifications to the rational mode of research and policy. It incorporates updates to the IRB process for social and behavioral science research. And, importantly, it adds new material on the growing movement for open science.
- Chapter 17 on how to find, review, and present research incorporates new and updated material on open-access journals. It also includes new examples of the presentation of findings in the form of visualizations of both quantitative and quantitative data.

Finally, we and SAGE have revised the supplementary materials, which are available on SAGE's companion website for this book at **edge.sagepub.com/remler3e**. We have updated the instructor's manual for each chapter, including a description of key differences between editions. Importantly, the manual for each chapter provides in-class exercises for active learning. We also now list the key terms in the instructor's manual, rather than at the end of each chapter. The glossary contains both key terms (**color-bolded in the text**) and non-key glossary terms (*color-italicized in the text*). Key terms are those readers should learn to use, while non-key terms are those readers may need to look up. The test bank has also been improved and expanded, and the slides are now accessible to people with visual disabilities and are compatible with screen reader technology.

We began planning work on this third edition in 2018, shortly after the editor of our earlier editions, Vicki Knight, retired and our new editor, Leah Fargotstein, took over. We enjoyed brainstorming ideas with Leah as we began early work on revisions in 2019. But we did the majority of our revisions in 2020 during the COVID-19 pandemic. Perhaps we benefited from being stuck at home, like much of the rest of the world, and less distracted by meetings, travel, and other things. We were fortunate, amidst so much sorrow and difficulty, to lose ourselves in a project that we felt really good about. Our revisions took a lot longer than we had planned, but we are pleased with how they turned out. And we hope that instructors, students, and others will also appreciate and benefit from the improvements we have made in this third edition.

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Dahlia lives with her husband, Howard, in New York City, where they enjoy the city's theaters, restaurants, and parks—and Dahlia enjoys being a complete amateur dancer in some of the city's superb dance studios.

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Gregg has published many scholarly articles on housing and welfare programs, performance measurement and evaluation, and public opinion about government services and institutions. His work has appeared in the *Journal of Policy Analysis and Management*, the *Journal of Public Administration Research and Theory*, *Nonprofit and Voluntary Sector Quarterly*, *Public Administration Review*, *Public Management Review*, and other journals. He is editor, with Oliver James and Sebastian Jilke, of the book *Experiments in Public Management Research* (Cambridge University Press, 2017).

Gregg lives in New York City with his wife, Ada (a history professor at NYU), and has two grown daughters, Alina and Lucia. They enjoy the local culture in their Greenwich Village neighborhood, escaping on occasion to Miami, Maine, Spain, Cuba, and other interesting places in the world.

PART I

FOUNDATIONS

1. Research in the Real World
2. Theory, Models, and Research Questions
3. Qualitative Research

This first part of the book introduces you to research and its many uses in the real world, hopefully inspiring you to want to dig deeper and discover more. It also covers the theories, models, and research questions that guide researchers' thinking and that provide a foundation for creating and evaluating evidence. And this part of the book introduces you to qualitative research, which is an important starting point for exploring the social world as well as a useful method for developing theories, models, and research questions. Together, these chapters provide a foundation for understanding and applying research methods.

CHAPTER 1

RESEARCH IN THE REAL WORLD

Thousands of studies have looked at global warming.

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LEARNING OBJECTIVES

After reading this chapter, you should be able to

- Recognize how research informs policy and practice
- Understand the character of research as a form of knowing
- Appreciate the limitations of research
- Distinguish causal and descriptive questions
- Describe key ethical principles of human subjects research

Overview: In this chapter, you will learn why research methods matter—not just for those who do research but for those who apply it to policy making, management, and other important decisions in life. Research provides a fact base for decisions and helps win arguments; and sometimes (if you're not careful), research misleads. Knowing research methods also provides a foundation for understanding performance measurement, program evaluation, analytics, big data, and the push for evidence-based policy and practice in many fields. You will see how descriptive ("what is") questions differ from causal ("what if") questions and what defines research and the scientific method more generally as a way of knowing about the world. And you will learn about the ethics of doing research with human participants—ethics that shape social and policy research. This chapter aims to expand your appreciation of research methods—and to help you approach the rest of the book with an open and informed perspective.

Do Methods Matter?

We want to do things in our lives and in our work to make a difference in the world—to educate children, treat or prevent sickness, reduce crime, promote the arts, develop innovative products, feed the hungry, house the homeless, satisfy clients, and improve our workplaces and our communities. We share a desire to do something meaningful, to leave our mark in the world. But doing so requires a base of evidence beyond our own personal knowledge and experience—evidence about how things really are and evidence about how to make things better.

We need such evidence not only to enhance our own understanding and decision making but also to convince others—those with the authority and resources that we need to accomplish our aims or those with opposing points of view who stand in our way.

Good Evidence Comes From Well-Made Research

The best evidence comes from good research. Good research can appear in the form of a study published in a journal, but it can also be an internal analysis of administrative data, a government or foundation report, a performance measurement brief, a program evaluation, a needs assessment, or a client or employee survey. Government agencies and international organizations collect and disseminate a great variety of empirical evidence on many important topics, such as health services and outcomes, educational attainment, labor market characteristics, crime victimization and punishment, housing conditions, environmental air and water quality, and so on.

Because of the internet and modern communications technology, we now live and work in a world in which an abundance of data, studies, and statistics surround us and hover within easy grasp—provided we know what to choose, how to make sense of it, and where to apply it.

Good research—just like a good car or a good piece of software—must be well designed and well made. But we cannot simply rely on brand names (although knowing that research comes from a respected scientific journal or reputable research institution does provide some assurance). Still, each study is unique, and each has its own strengths and weaknesses. So we need to understand how research is made—that is, research methods.

Research methods are the techniques and procedures that produce research evidence, such as sampling strategies, measurement instruments, planned comparisons, and statistical techniques. So we need to understand research methods to judge the quality of a study and the evidence it provides. Research methods are what this book is all about.

May the Best Methods Win

We also need an understanding of research methods to attack evidence that hurts our cause or defend evidence that helps it.

Consider the controversy over abstinence-only sex education for teenagers. Some communities feel strongly that teens should be discouraged as much as possible from engaging in sexual activity and that comprehensive sex education (which can involve distributing condoms and instructing teens in their use) sends the wrong signal. Others warn that the abstinence-only approach does little to change the reality of teenagers' lives, leaving them vulnerable to unwanted pregnancy and sexually transmitted diseases (including AIDS).

As is often the case with a controversial public policy issue, both sides can point to studies to bolster their arguments. A review by Douglas Kirby (2007) located 115 studies of various pregnancy prevention programs targeting U.S. teens, including abstinence and comprehensive programs. So neither side can win just by pointing to "*a* study" that supports its position.

Instead, we must struggle over how well made the conflicting studies are—meaning their methods. The argument may be won by having a better-made study—or lost by having a poorly made one. So although the war may start from a substantive policy disagreement, such as how best to provide sex education to teens, the battles often rage over research methods.

Research-Savvy People Rule

Some of you may be training to become researchers or analysts—so doing research will be (or already is) part of your job. Clearly, knowing research methods is important to you. But many of you are (or plan to be) practitioners, doers—implementing programs, delivering services, managing people, or leading organizations. Why do you need to know research methods? We've already suggested a few reasons: Good research provides a fact base for decisions and wins arguments, and the quality of research often hinges on the methods used. But knowing research methods can help your career more directly as well.

We live and work in an "information age" in which the ability to find, understand, and make use of complex sources of information—such as research—is an important skill. An explosion of data of all kinds—from governments, businesses, and virtually every other institution or activity in our lives—means that those who know how to handle, analyze, and interpret data have great value to organizations and employers. Organizations regularly generate analytics and commission studies, and so their top leaders or managers must know how to

make sense of and apply this information to improve policies and programs. Funding agencies and legislative bodies demand "evidence-based"—meaning research-based—programs and management reforms. To win funding for your program or organization, you need the ability to demonstrate an understanding of research in your field of policy or practice.

So without a grasp of research methods, you will be at a disadvantage in applying for jobs, advancing into leadership positions, and attracting financial and political support for your program or cause. With a good understanding of research methods, you can do more and go farther in your career.

Research, Policy, and Practice

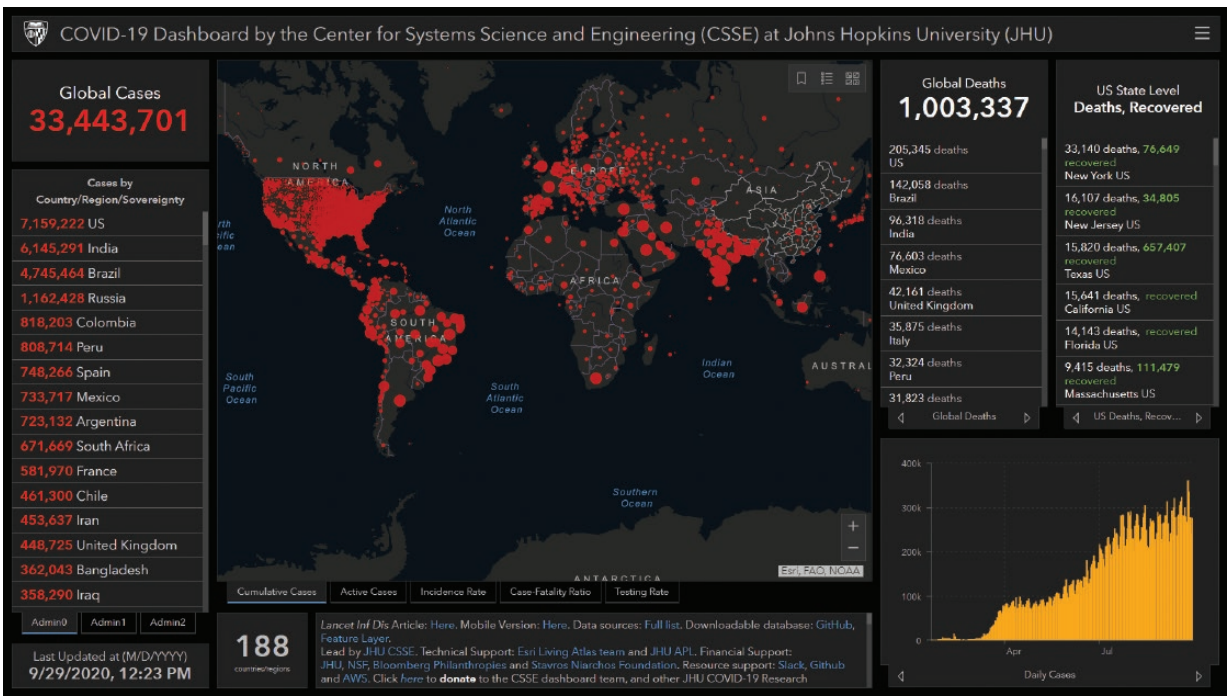
Research has become an essential element of modern public policy and management in the form of analytics, performance measurement, program evaluation, and the push for evidence-based policy and practices.

Analytics

The term *analytics* is everywhere: "Google analytics," "business analytics," "urban analytics," and analytics for education, health care, human resource management, marketing, and other fields. Often people expect to see analytics in a dashboard or other visualization. For example, Figure 1.1 shows a coronavirus dashboard created by a team at Johns Hopkins University during the outbreak of the pandemic in Europe and the United States. Figure 1.2 shows a more everyday social media dashboard.

▼ FIGURE 1.1

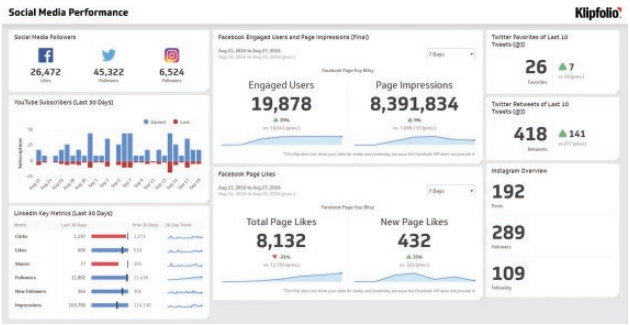
Coronavirus Analytics Dashboard



Source: Johns Hopkins University, retrieved from https://coronavirus.jhu.edu/map.html on September 29, 2020, at 1:30 PM EST, shortly after global deaths surpassed 1 million.

▼ FIGURE 1.2

Social Media Analytics Dashboard



Source: Klipfolio, retrieved from https://www.klipfolio.com/resources/dashboard-examples/social-media on March 24, 2020.

What are analytics—and how do they differ from more traditional research and analysis, the topic of this book? Although the term refers to a wide variety of things, **analytics** are usually real-time, frequently changing metrics and charts that describe an ongoing flow of activity or behavior, such as the coronavirus pandemic (Figure 1.1) or social media activity (Figure 1.2). The term also implies that the analytics—the numbers and charts—are displayed in ways that are readily available and useful for decision making. Analytics often appear intuitive and easy to use—no training required. But like more traditional research and analyses, analytics can be misinterpreted and may lead to wrong conclusions.

In this book, you will learn skills that can help you more effectively interpret and apply analytics on the job or in life. You'll learn how to judge when trends over time or differences between groups represent real changes rather than just a transient blip or random fluke. And you will see how to use analytics and other evidence to figure out what works—and how well it works. You may even get some ideas from this book that help you employ analytics software to configure better and more useful analytics dashboards for your own needs.

Performance Measurement

Many fields these days emphasize **performance measurement** and performance management. The idea is sensible: We should measure how well we're doing and ideally manage to improve it. New York City's CompStat program—a data-driven effort to map and track crimes and hold police commanders accountable—is a well-known example that has spread to other policy areas (Behn, 2014). Indeed, the push to measure performance is now big in education, business, health care, and many other fields. The mass of data available today, thanks to the information revolution, fuels this trend. Performance measurement has now become a pillar of contemporary policy and practice in the public and nonprofit sectors (Hatry, 2007; Kaplan & Harvard Business School, 2009; Poister, Aristigueta, & Hall, 2014).

In the following chapters, you will see how logic models can help you figure out what to measure. You will learn what makes for valid and reliable measurements. And you will be introduced to various sources of data to measure outputs and outcomes, including both existing data and original surveys. All this material is critical to understanding and implementing performance measurement and management.

Evaluation Research

Much **evaluation research** aims to answer these questions: Did a program or intervention have an impact? Did it improve or change things? Other program evaluations seek to describe or fine-tune the implementation of the program; these are referred to as process or formative evaluations. Evaluation research is now a standard requirement of most government or foundation grants and contracts. Most new policy or management initiatives demand some form of evaluation as well. So evaluation research, too, has become a pillar of contemporary policy making and management in the government, the nonprofit sector, and even the business world (Rossi, Lipsey, & Freeman, 2003; C. Weiss, 1997).

But how can we know if a program or initiative is having its intended effect? Later chapters will introduce you to the basic ideas involved in thinking about cause and effect. They will cover strategies for estimating causal effects, including the use of control variables, randomized experiments, and various forms of what are called natural and quasi experiments. These are the major strategies for conducting evaluations of program impact.

Evidence-Based Policy and Programs

As suggested earlier, governments, businesses, and nonprofit organizations increasingly favor evidence-based policies and programs—strategies that have proven their effectiveness with research. It's not enough anymore to have a few heartwarming testimonials or a plan that just looks good on paper. The trend toward evidence-based policy and practice now permeates many fields (Davies, Nutley, & Smith, 2000). The rigorous testing of nudges, which are light-touch interventions aimed at changing health, social, or economic behaviors (Thaler & Sunstein, 2008), is an important example. Political campaigns now make much use of data and evidence-based approaches to gathering votes (Nickerson & Rogers, 2014).

Due to limited resources, policy makers and practitioners must often choose between effective programs. Therefore, comparing the effectiveness of different programs is crucial, as is comparing *cost-effectiveness*—the outcome obtained relative to the cost of the program. Such comparisons require evidence about the magnitude of a program's effect—how large an influence a program has on the outcome.

The chapters that follow will give you tools to identify and assess evidence that supports or can improve your program or initiative. And they will help you understand how to produce good research evidence to support your aims.

Evidence Can Mislead

On top of all that we've mentioned so far about the importance of research methods, it can be embarrassing to be wrong—and sometimes, if you're not careful, evidence can mislead.

QUESTION

What examples have you seen of performance measurement, program evaluation, or a focus on evidenced-based policy in your work or area of interest?

Misleading Measurements

No Child Left Behind (NCLB) was signed into law in 2002, setting in motion a wave of reform in schools all across the United States that became suddenly preoccupied with high-stakes testing, worried about closing the race gap, and apprehensive about the need to demonstrate rapid gains in test scores. NCLB won support in part because of the "Houston miracle," the fact that this large, diverse city had itself demonstrated remarkable gains in reading and math scores, especially for Black and Hispanic students—at least according to scores on the Texas Assessment of Academic Skills (TAAS). If Houston could do it, so could the rest of the nation.

But scores on another test—the Stanford Achievement Test—taken by the same Houston students during the same school years showed a much different picture, according to an analysis by the *New York Times* (Schemo & Fessenden, 2003). Scores on the Stanford test, which is used nationwide, showed little or no gain overall in Houston and little or no narrowing of the race gap. Several well-known experts in education statistics, asked by the *New York Times* to review the discrepancy, concluded that the TAAS had considerably overstated the progress made by Houston students. Standardized tests do not necessarily provide a consistent measure.

Misleading Samples

As Pennsylvania considered legalizing marijuana, a PoliticsPA.com (2019) poll asked its readers "Should PA legalize recreational marijuana?" Marijuana legalization has become a major public policy issue facing many states with important health and financial implications. Nearly 1,500 people responded to the poll, and the results showed that fully 90 percent favored legalization. But the PoliticsPA reader's poll relied on a voluntary sample—visitors to the online news site who found the poll and decided to participate.

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Representative surveys show that a majority supports the legalization of marijuana.

A few weeks later, the Franklin and Marshall College Poll (2019) conducted a telephone survey that involved calling a random sample of 540 registered voters in the state. This poll found that only 59 percent favored marijuana legalization—a clear majority but still a finding that suggests a more divided view of the issue. Which survey do we believe? The Franklin and Marshall College Poll uses much better methods—including careful random sampling—to produce its results. And representativeness depends on the method of selecting the sample, not on how large the sample is. The true level of support for marijuana legalization in Pennsylvania is thus much closer to 59 percent than it is to the strikingly high figure of 90 percent, despite the larger sample in the PoliticsPA poll.

Misleading Correlations

A study of children less than two years of age found that those who slept with nighttime lighting were five times as likely to have myopia (nearsightedness) than those who slept in the dark (Quinn et al., 1999). In other words, the researchers found a correlation in their sample of small children between having night-lights and being nearsighted. Media articles reported on the study and suggested parents should stop using night-lights.

A later study, however, found that parents who themselves were nearsighted were more likely to use night-lights with their children, perhaps because of their own vision difficulties (Zadnik et al., 2000). If children inherit myopia from their parents and if parents with myopia are more likely to give their children night-lights, then the night-lights aren't causing the children to become myopic. This is an example of a **spurious relationship**: when two variables are correlated because both are a reflection of a third, underlying variable or common cause—in this case, the myopia of the parents. Thus, contrary to the media reports, the correlation is not a reason for parents to stop giving their children night-lights.

QUESTION

Can you think of any other examples of a misleading measurement, sample, or correlation?

What Is Research?

This book is about research methods—but what is research? We can define research as a social and intellectual activity that involves systematic inquiry aimed at accurately describing and explaining the world. But it helps to get a bit more specific.

Secondary and Primary Research

People often "research" a topic at the library or on the internet. Such information searches and syntheses are best referred to as **secondary research**—the search for published sources describing the results of research or information provided by others. While secondary research is an important skill that we cover in the last chapter (Chapter 17), it is not the focus of most of what we cover in this book, nor is it what we mean when we use the word *research*.

Rather, we use the term *research* to refer mostly to original research, or **primary research**—the original collection or analysis of data to answer a new research question or to produce new knowledge. In journals, such studies are referred to as original contributions. What gets confusing is that original or primary research can involve **primary data** collection—collecting *new* data to provide a description or explanation of the world. But it can also involve the original analysis of **secondary data**—data collected by others, such as existing government surveys, administrative records, or transcripts. Indeed, much primary research makes use of secondary data.

Unfortunately, the term *data* can also be a bit confusing. When we look up a few published facts or even a table of statistics online or in the library, we sometimes refer to this as finding "data" on a topic. But in this book, we use the term **data** to refer to largely unprocessed observations—a data set or raw data, they're sometimes called.

QUESTION

In your own words, explain the differences between primary and secondary research and between primary and secondary data.

It Comes in Various Shapes and Sizes

As you will see from the many examples throughout the chapters in this book, research comes in a surprisingly wide variety of shapes and sizes:

- Large-scale studies of broad populations
- Small-scale studies of one locally situated group
- Snapshots in time
- Studies of outcomes or events that occur over many periods of time
- Laboratory experiments
- Naturalistic observations of real-world settings
- Carefully planned interventions
- Formal modeling or theoretical analyses
- Opportunistic discoveries of unplanned events
- Simulations
- Informal research conducted for the purpose of organizational strategy or management

One of the important points to realize about research, and about researchers, is that inventiveness and creativity are an important part of the process. Good research often involves the imaginative application of new methods, innovative techniques, or clever strategies to learn about the world.

It's Never Perfect

Research, like everything else that is human, is not perfect—far from it. Every study has weaknesses, as you will see in this book. It is important to spot these shortcomings and understand their implications.

But it is also important not to discard a study entirely because it has some methodological or other shortcomings. We don't want to throw the baby out with the bathwater. Every study has strengths, too—or at least most studies do. There is often something to be learned from almost any study, and the perfect study is just not possible—especially in social and policy research. A good consumer of research can both spot the weaknesses and recognize the strengths.

It's Uncertain and Contingent

Many think of research as providing certain and universal conclusions. But research evidence often includes a large dose of *uncertainty*, typically expressed in the form of

probability statements or qualified conclusions. Thus, researchers talk about the results "indicating" this or that, "suggesting" that something is true, or showing that an outcome was "likely" due to a presumed cause. In part, this comes from the language of modern statistics, which uses the laws of probability to make inferences about unknown populations or causes. But this way of speaking and writing also reflects the inherent uncertainties involved in making firm statements or conclusions about complex human and public affairs.

Social and policy research is also **contingent**—bounded in space, time, and context. A study that finds evidence for the effectiveness of an education reform in one school district, for example, may not hold true in other districts with different children, teachers, budgets, and administrative structures. A mental health intervention that is shown to be effective with affluent suburban adults may not have the same effect on poor, rural adults living very different lives. The motivations found to encourage productivity in one organization may not be the same as the motivations that matter in another organization.

It Aims to Generalize

Generalizability is the ability to take the results of research and apply them in situations other than the exact one in which the research was carried out. Although we just noted that research is often contingent, researchers nevertheless strive at the same time to make their work generalizable. This is quite important: If the research results only apply in the exact setting (time, place, circumstances) in which the study was conducted, then they cannot be used to inform policies or practices in other situations.

For example, a study might examine a policy of requiring out-of-pocket payments for emergency visits to the hospital and find no impact on health outcomes for patients. But say the study is done using data from one insurance plan that covers mostly younger, healthy workers with good incomes. Do the results apply to insurance plans that cover older, less healthy individuals with low incomes? Probably not: Such individuals might well behave differently if required to make payments for their emergency visits. So the study has limited generalizability. We might even worry that the study is only relevant for that one particular insurance plan and the population it serves, making it of little use to anyone else. While generalizability is always a goal, real-world research is often less generalizable than we would like.

This is not to say that social and policy research has little to offer—on the contrary. But you do need to be realistic and appreciate the limits, as well as the rewards, of research.

Bits and Pieces of a Puzzle

For these reasons, a single study is almost never definitive; rather, empirical evidence on a topic is cumulative. Research produces a *body* of evidence, and researchers talk about arriving at a scientific *consensus* within the bounds of what is likely to be true (or not).

Consider global warming—is the world really heating up, and if so, is global warming natural or attributable to humans? There have been thousands of individual studies of various aspects of global warming over the years, from tracking the melting of the polar ice caps to observing animal species, mapping storms and rainfall, sampling the level of CO_2 and other greenhouse gases in the atmosphere, and so on. None of these studies alone definitively proves that human activity is causing the earth to get hotter—indeed, some contradict this hypothesis. To help establish a consensus—particularly given the monumental economic costs and political complexities involved in responding to global warming—the United Nations (UN) and the U.S. federal government each established

scientific panels to review the research evidence. The UN's Intergovernmental Panel on Climate Change (IPCC, 2019) concluded that "human activities are estimated to have caused approximately 1.0°C of global warming above pre-industrial levels, with a likely range of 0.8°C to 1.2°C" (p. 4).

The U.S. Global Change Research Program (2017) similarly found that "it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century" (p. 10). But to arrive at these conclusions took many years of research and thousands of individual studies—not to mention much political debate. And the process goes on.

The same kind of process of accumulating evidence, engaging in scientific debate, and searching for consensus characterizes most areas of research. Of course, most topics of research do not inspire as many studies or the establishment of large national or multinational scientific panels to search for a consensus. Nevertheless, something similar happens on a smaller, quieter scale in the various journals, research conferences, and institutions where studies on a topic are presented and debated. But consensus is not always, or even often, possible: Too much is unknown, and more research remains to be done.

QUESTION

Explain in your own words the meaning of generalizability.

It Involves Competition and Criticism

The process of research is also one of continual competition and criticism—the continuous testing of the consensus. There are researchers who doubt aspects of the human-made global warming hypothesis, for example, and they are busy conducting and gathering evidence to challenge, or at least refine, the consensus. Conclusions that withstand this kind of competitive onslaught become what we consider to be established knowledge (for the time being).

The formal expression of this critical attitude is the process of **peer review**. Most research journals, as well as research funding programs, use a peer-review process in which the studies or proposals are reviewed and approved (or rejected) by a group of peers—other researchers in the same field—who render a judgment on the methods and worth of the paper or proposal. This process is usually blind (neither the researcher nor the reviewer knows who is who) to rule out favoritism and to encourage reviewers to be honest and forthright in their criticism. You, too, should think in this honest, critical way as you hear or read about research (although, of course, sometimes even the best and most experienced researchers struggle to keep an open mind).

It Can Be Quantitative, Qualitative, or a Mix of Both

Much research involves numerical measurement and statistics, but research can also involve language, images, and other forms of expressing meaning that researchers then interpret. The former is referred to as quantitative research; the latter, as qualitative research. Qualitative studies involving the interpretation of language can be done rigorously—despite the lack of scientific-looking tables and formulas. Numbers do not make a study good or scientific.

Social and policy research also uses mixed methods that combine the advantages of both quantitative and qualitative techniques. Because social phenomena are so difficult to pin down, researchers often use multiple methods to confirm a finding, a process sometimes referred to as triangulation.

Although most of the chapters in this book are devoted to topics typically thought of as part of quantitative research, we discuss the role and contribution of qualitative research in all of the chapters. And we devote an early chapter (Chapter 3) specifically to qualitative research because we consider it to be foundational. In an important sense, good quantitative research is based on good qualitative research. The two perspectives enhance one another.

It Can Be Applied or Basic

Research can be *applied*—done because we have a practical need to know. For example: How many people are currently unemployed? Would smaller classes improve learning? Does adding police officers reduce crime? **Applied research** typically has direct implications for policy and practice. Many of the examples in this book focus on applied research.

But research can also be *basic*—the pursuit of knowledge for its own sake rather than because of an immediate practical need. **Basic research** in a given field also tends to focus on more abstract or fundamental processes of nature or society. For example, we might be interested in studying how people make decisions involving uncertainty, how the human body responds to long-term exposure to stress, how children acquire a language, or the evolutionary basis of human cooperation. Basic research also advances policy and practice by providing a solid foundation of knowledge. But the link is less direct.

Descriptive and Causal Research

Research sometimes aims simply to describe the world—how things are. At other times, its goal is to provide a causal explanation—how would things be different if we changed something? This basic distinction is fundamental to thinking about and conducting research and provides a road map of sorts for the rest of this book.

QUESTION

In your own words, describe some of the defining characteristics of social science research.

Description: What Is the World Like?

Concern about autism has been growing for some time, and parents and other advocates have pressed for services to help autistic children and for more research about the disease. In evaluating how to react to autism, policy makers and practitioners need to know how many people (and particularly children) with autism there are in the population. They need to know if the rate of autism is growing—and, if so, how quickly. They need to know whether autism is more concentrated in certain places or groups in the population. They need to know the severity and forms of autism. In other words, policy makers and practitioners need a good *description* of autism to address the problem.

The goal of **descriptive research** is to paint an accurate picture of the way the world is. Descriptive research includes describing just one variable—such as the rate of autism in the population. It also includes describing **relationships**—how two different variables are related (see Chapter 2). Relationships are often referred to as associations or correlations. For example, autism rates have been growing, so time and autism are related. Or at least it seems so—researchers worry that perhaps we have simply gotten better over time at identifying people with autism and that this enhanced ability to identify the disease accounts for the upward trend. Autism and geographical region are also related—the disease is more common in California, for example, than in other parts of the United States. But it turns out that this description is not so certain—perhaps autism is not consistently identified everywhere. Descriptive research can be harder than you might expect.

Before figuring out what to do about a problem like autism, the problem must be described. Knowing the lay of the land is important before deciding where to go. But once practitioners have described the problem, the task of tackling and solving it has just begun. After all, we want to figure out how to make things better—not just sit around and watch things happen. In the case of autism, policy makers and practitioners want to figure out how to prevent and hopefully cure, or at least ameliorate, the disease.

Causation: How Would the World Be Different If Something Changed?

The goal of **causal research** is to answer "what if" questions, to find out how to make things happen. Specifically, causal research asks, If we change something, will other things (outcomes we care about, such as autism) change in response? And if they do change, by how much?

For example, what happens to the risk of autism if parents wait until they are older to have children? Would the risk change at all? If so, by how much? More generally, we want to know what factors have caused the growth of autism over time (if indeed the trend is real and not just an artifact of better identification techniques).

Descriptive and causal research are both important in practice, but answering causal questions is especially central to the work of practitioners. Public policies, social programs, and management initiatives aim to do things—to make something happen. So answering questions such as "What will happen if we do X?" is essential.

Description of a Correlation Is Not Proof of Causation

It is easy to confuse correlation, the description of a relationship, with causation. If more educated mothers are more likely than less educated mothers to have children with autism—a correlation—then it is easy to conclude that something about educated mothers causes autism. However, that may not be so. Think about the earlier example of nightlights and nearsightedness in young children. When researchers, policy makers, or practitioners naively assume that a correlation implies causation, grave errors can be made.

For example, because autism rose over the same period that vaccine use rose and because autism symptoms start at about the same time that toddlers receive many vaccines, people began to suspect that vaccines cause autism. Some parents even started to reject vaccines, resulting in outbreaks of previously suppressed illnesses. In fact, there is no evidence that vaccines cause autism and, indeed, significant evidence that they do not (CDC, 2020b).

One of the most important skills you will gain from this book is how to distinguish a correlation, the description of a relationship, from evidence of a causal effect. And you will learn how to better judge good causal evidence of what works, and how well it works.

Because distinguishing description from causation is so important, we have organized this book around that distinction. Part II of the book covers strategies for description while Part IV covers strategies for causation. We will stress again and again the distinctions between description and causation and between correlation and causation. We will also emphasize the many strategies and techniques for drawing causal conclusions, especially for learning what kinds of programs work and how well they work.

QUESTION

What is the difference between descriptive and causal research?

Epistemology: Ways of Knowing

How much do you weigh? How do you *know* that's how much you weigh? Probably you used a scale and remember the result. You measured your weight—an elementary act of research. How high is Mount Everest? If you know, how do you know? Did you measure it? If you don't know, how might you try to learn how high Mount Everest is? You will probably turn to other sources, perhaps searching the internet and examining a website that you trust (secondary research). But of course, you should consider how the website got its information.

We have many ways of knowing—what philosophers of science call **epistemologies**. Sometimes we directly learn something ourselves. But we can't do that about most things in the world. Often, we just accept what some trusted authority says is true. Sometimes, we rely on knowledge that comes from our cultural or religious traditions. We know other things through intuition or common sense.

The Scientific Method

There are many ways of knowing things, but in modern society the scientific method is a privileged way of knowing. Most of the ideas and techniques presented in this book are based on the scientific method.

Obviously, you cannot directly research everything you need to know on your own. So this book will teach you not only how to do research but how to critically assess and make use of the research produced and published by others. It will also help you judge knowledge that comes from authority, tradition, and common sense more effectively by using the standards of the scientific method.

The **scientific method** can be defined as an approach to acquiring and correcting our knowledge about the world. It has several key characteristics:

- Systematic observation—or measurement of various features or behaviors in the world (including qualitative observation).
- Logical explanation—in the form of a theory or model that makes sense according to basic rules of logic and accepted facts.

- Prediction—in the form of a hypothesis, based on a theory, of what we will observe if the theory is true. (This is seen as superior to after-the-fact, or ex post facto, explanations, which are not falsifiable.)
- Openness—meaning the methods used to produce evidence are clearly documented and made available for review. This allows for replication—repeating the study to see if the results hold (and in what contexts).
- Skepticism—researchers scrutinize and critique each other's work, a process referred to as peer review, in search of possible shortcomings or alternative explanations.

In sum, the scientific method is a privileged form of knowing because it is generally transparent, logical, and fact based. But scientific evidence can be misrepresented or misused, so you still need to question scientific knowledge just as you would question common sense, tradition, or authority. There are also varying understandings of what constitutes the scientific method, and this understanding has changed over time and across scientific fields (Godfrey-Smith, 2003).

Are There Objective Truths in Social Science?

The scientific method originated with the natural sciences. Newton's physics, Galileo's astronomy, Lavoisier's chemistry, and Mendel's genetics are early examples. But the social world is different from the physical or biological worlds due to factors such as human consciousness, culture, history, and politics. And social phenomena vary by place and time much more than do physical or biological phenomena.

As a result, knowledge produced by the social sciences, such as how markets work or how children learn, is more contingent and less generalizable than is knowledge produced by the natural sciences. Moreover, how we interpret social phenomena is shaped in part by language and culturally constructed categories. These categories even influence the kinds of social objects or actions we observe, and our social constructions also vary from time to time, from culture to culture, and from political perspective to political perspective. So even when we try to be objective, our interpretations will be influenced by our categories of subjective experience and judgment.

Because social ideas and facts are constructed in this way, some people reject the relevance of the scientific method to the study of society and public policy. Indeed, others reject the idea that an objective truth, even a contingent truth, exists for social phenomena outside of our various subjective, socially constructed vantage points. This skeptical view is generally referred to as *antipositivism* because it is opposed to so-called **positivism**, the approach of social researchers who pattern their work after the natural sciences. However, positivism has a more precise meaning in the philosophy of science, where it refers to a rather strict form of empiricism (such as behaviorism in psychology). We acknowledge that ideas and even observations about social phenomena are inevitably influenced by social constructions, particularly by history and culture. Nonetheless, we believe that the scientific method, broadly defined, provides the most pragmatic approach to understanding and solving many of the pressing social problems we face today.

Our perspective in this book can be described generally as **scientific realism** (Bunge, 1993; Godfrey-Smith, 2003): "realism" because we believe that the social world,

although profoundly shaped by human history and culture, is still part of an objective reality that exists outside of our thoughts and perceptions, and "scientific" because we believe it is possible to use the scientific method—or methods modeled on the scientific approach—to learn about and understand the social world.

Induction and Deduction

There are several ways in which researchers employ the scientific method to tackle a problem or curiosity, as illustrated in Figure 1.3. One approach is to begin by doing systematic observation of the world and then developing a logical explanation (theory) to account for what is seen—an approach referred to as **induction**. In anthropology, for example, researchers typically observe people in a community for some time before developing an explanatory theory. Qualitative research, described in Chapter 3, is often inductive. Induction also happens in quantitative research when many possible relationships between variables are explored before an explanatory theory emerges from the observed patterns. With the proliferation of data, including big data, inductive research has grown.

The other approach is **deduction**: The researcher moves straight to the development of a logical explanation or theory and only later gathers evidence to test the theory. For example, rational choice theorists in economics and other fields approach many problems with the fundamental assumption that people or institutions will seek to maximize their gains and minimize their losses. Starting from this assumption, they then generate hypotheses and predictions about not only economic decisions but also such things as racial discrimination, marriage, and voting (Becker & Becker, 1998). In social research, some researchers called **structuralists** insist that social research must always start with theories and test these with empirical predictions.

Most researchers, however, practice a combination of induction and deduction. They have a theory in mind, gather data to test it, but then explore the data to refine their theory or even develop new theories.

Proof Requires Fresh Data

While most researchers practice a combination of induction and deduction, even in a single study, the structuralists have a point that applies broadly in research: *Data cannot be used to both develop a theory and definitively confirm it.*[1] Fresh data are required to truly test a theory or support a hypothesis. Think of your favorite detective novel. Detective X uses induction to come up with a theory of the crime that fits all the existing clues. The theory suggests some previously unknown and unsuspected fact—red clay on the perpetrator's shoes, for example. If the prediction matches the fact, the perpetrator's guilt appears much more likely. Prediction provides powerful proof.

In social and policy research, some studies strive to generate theory while others aim to test theories. Research is often an iterative process in which deduction and induction alternate (as Figure 1.3 illustrates).

[1]We cover this issue in more detail in Chapters 9 and 10.