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Effective Research Methods for Any Project

Course Guidebook

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Dr. Rosen's research specialization is the scholarship of teaching and learning, with particular focus on games and simulations, experiential learning, human rights education, and transparent teaching. She also works on climate change policy making, issues of human security, and international human rights of marriage and the family.

Dr. Rosen's work can be found in the *Journal of Political Science Education*; *PS: Political Science & Politics*; *International Studies Perspectives*; and *Politics & Policy*. She has authored chapters in *Human Rights in Higher Education: Institutional, Classroom, and Community Approaches to Teaching Social Justice* as well as in *Learning from Each Other: Refining the Practice of Teaching in Higher Education*. She is also a cofounder of the *Active Learning in Political Science* blog.

Dr. Rosen's work on teaching methods has been recognized with numerous teaching awards, including the International Studies Association's Deborah Gerner Innovative Teaching Award, the William T. Kemper Award for Teaching Excellence, and the CQ Press Award for Teaching Innovation. She has led numerous workshops on teaching and pedagogy at conferences and universities and serves as the vice president and program chair for the International Studies Association's International Education section.

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Effective Research Methods for Any Project

This course will give you the tools you need to conduct research—whether you have to do a project for work or because there is a question you've always wanted to answer, a puzzle you want to solve, or a program you want to evaluate. Research isn't just for academics and scientists; it's for everyone. You will learn guidelines and systematic methods that will show you the value of knowing the ins and outs of research in your everyday life and give you the tools to answer questions both large and small.

The first part of the course focuses on the fundamentals of research, taking the scientific method as the framework for everything that follows. You will learn what good research looks like so that you can evaluate your own work as well as the claims and findings of others. You will discover what sound practice in research looks like, and you will be able to see whether others follow it. You will follow the path of ethics in research, seeing what research looked like before the sound ethical principles of the *Belmont Report* existed to guide the study of human behavior. Topics will quickly become research questions, and thoroughly reviewing the literature will help crystalize the hypotheses, theories, and other ideas that will allow you to start designing your research project.

The second part of the course turns to the many design tools you will put in your toolbox so that you can bring them out as needed for any individual question or project. You will learn how to select the best research design for your project and how to measure your concepts and variables so that you can actually observe them. You will also give some thought as to who you are studying and learn why you don't have to study every member of that group to be able to say something interesting about it. All the classic research designs will compete for use in your project—from experiments to surveys and from case studies to fieldwork. After you are introduced to the interpretation of election polls, you will consider the interpretivist challenge to positivist research as well as applied, action, and evaluation research.

With your design chosen, it's time to move on to the third part of the course: data analysis and presentation. First, you will learn how to get your data in order and ready for analysis. Then, you will review a variety of quantitative and qualitative analysis techniques. Whatever kind of data you have, you will learn some tools for how to test your hypotheses and assess your claims. Along the way, you will learn why you cannot infer causation from correlation and why statistical significance is so important to interpreting your results. You will also learn multiple different ways to evaluate qualitative data. Finally, you will learn how to communicate all you have learned, as the best way to advance knowledge is to share it. And the best part is you don't need to have strong math or science skills to do any of this. By the end of this course, you will have the tools you need to start your next stage in life as a full-fledged researcher.

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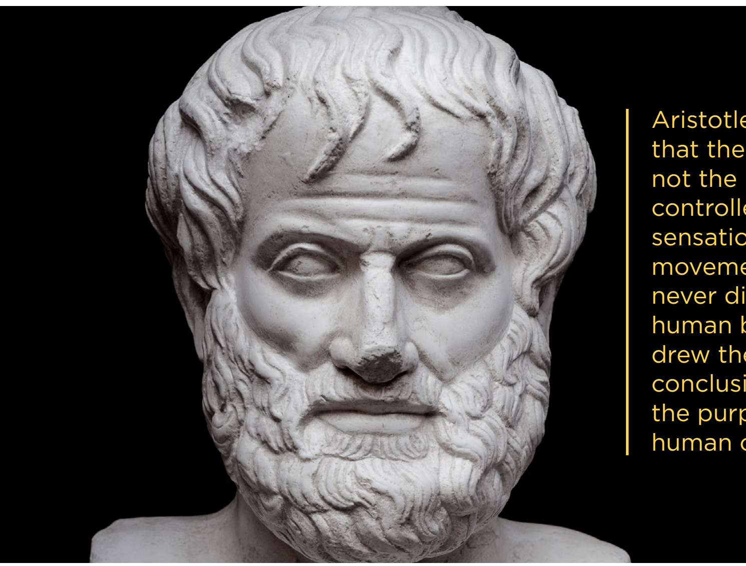
Why Research Methods Matter

Research methods include all the many ways researchers systematically study anything to better understand it, uncover new information about it, or explain why things happen as they do. While research is incremental and cumulative and requires continual testing, retesting, and debate, it is ultimately through the application of sound research methods and principles that we advance our understanding of the world. What makes the study of research methods so important is that it helps us see the inner workings of how knowledge is created. And it turns out that how we discover information about the world matters just as much as what we learn.

The world of scientific history is full of cases where preexisting and incorrect beliefs are challenged by the application of sound research methods. The idea that the world was hollow and flat and full of sea monsters was once held by the experts of the day, but it was discredited thanks to rigorous research.



Aristotle thought that the heart, not the brain, controlled sensation and movement. Having never dissected human bodies, he drew the wrong conclusions about the purposes of human organs.

TYPES OF RESEARCH

- Although there are many ways to classify research, it is generally divided into 2 broad categories: basic research and applied research.
    - **Basic research**—also known as fundamental, or pure, research—aims at answering questions that lead to gains in knowledge, understanding, and prediction. It's about advancing our general knowledge of how the world works.
    - **Applied research** aims at answering questions that lead to direct and practical applications in the world. Applied research uses the findings of basic research to develop practical solutions aimed at changing the world. Applied research must be grounded in the findings of basic research; the 2 are therefore interrelated.
- Another way of looking at research is focusing on the type of inquiry: exploratory, descriptive, or explanatory.
    - **Exploratory research** focuses on initial exploration. This is typically done as a precursor to other types of research to learn more about a topic or problem or what others have said about it. Maybe you want to study something about a general topic but don't know exactly what to focus on. Doing some exploratory research by reviewing the scholarly literature and seeing what kind of data and other studies exist would be a good start.
    - **Descriptive research** is when you attempt to describe something in detail but are not necessarily aiming at explaining why something is the way it is. Descriptive research aims at answering questions of who, what, when, and where.
    - **Explanatory research** can be a natural follow-up to descriptive research. It aims at questions of why and how; the goal is to evaluate cause and effect and explain why and how things work the way they do.

- Still another distinction in types of research is between quantitative and qualitative research.
  - **Quantitative research** focuses on analyzing large amounts of data that can be readily expressed in numbers.
  - **Qualitative work** can also have numbers but usually involves data that is not easily boiled down to numbers and therefore tends to focus on a smaller number of cases or subjects.

Quantitative work generally allows for greater breadth in the number of cases and variables that you study, while qualitative work sacrifices some breadth for the sake of depth, really digging into each case and variable that you study.

- Scholars and practitioners can get into heated debates over which general approach is better. Different disciplines focus on different approaches to research, and the nature of your project will often dictate which kind of research you do. But all these approaches are simply different forms of inquiry, and that's the key point: Regardless of the type of research you choose, ultimately you are trying to explore, describe, understand, explain, evaluate, or predict something about the world.
- Because research is about inquiry, it's important to understand that you don't always find what you expect. Take Alexander Fleming, who in 1928 discovered penicillin while investigating bacteria. In fact, many of the most important discoveries in the world were found largely by accident.
- Some discoverers actually end up regretting that they made their discoveries. Alfred Nobel—for whom many top prizes are named, including the Nobel Peace Prize—invented dynamite as a safer explosive for construction projects, never intending that it would be used as a weapon of war.

- When you do research, you have to be open to both the unintended and the undesired. You can't go into a research project thinking you already know the answer and only looking for information that confirms your preexisting ideas. You have to be open to what you find—to what the data tells you—even if it means your initial ideas are wrong.

- This is a fundamental principle of research and methods: You never set out to prove yourself correct. If anything, your job is to try your hardest to disprove your ideas. Only if you subject your initial thoughts to the most rigorous of tests, and they pass, can you have any confidence that your ideas might be right. If instead you set out to only find the information that confirms what you already believe, then you aren't doing research; you are just pushing a point of view or trying to make yourself look good.

- It's human nature to believe a study that confirms your existing beliefs, even if the study was poorly or unsystematically done. But the study that challenges your beliefs is the one that really deserves your attention.

Albert Einstein's discoveries in physics set the foundation for the invention of the atomic bomb, and he expressed deep remorse over how his work was used.

There are tons of research methods this course could cover, considering how many disciplines and areas of human endeavor depend on research. The course will focus, however, on empirical research that uses the scientific method as a way to find answers to questions.

While not all research is grounded in the scientific method, many of the principles of empirical, scientific research apply to all kinds of questions and problems. Therefore, the concepts, principles, and techniques that are covered in this course will aid you in your research, no matter what area you want to explore.

THE SCIENTIFIC METHOD OF RESEARCH

- The scientific method is a systematic approach to research that relies on observation, hypothesis formation, prediction, and hypothesis testing. In its essence, it is simply a process to follow that will get you from whatever research question you might have to an answer, regardless of your discipline, profession, or topic of study.

- The scientific method can be described in the following 6 steps. However, these steps should not be seen as a pure, literal path to follow. In some cases, you may do step 2 first and then go back to step 1. In other cases, it's a more cyclical process, where different steps feed into each other and you go back and forth between them, and one project leads directly into the next.

> The origins of the scientific method can be traced back to Aristotle, but it has been refined over the centuries—most notably between the 16th and 18th centuries by luminaries such as Francis Bacon and Sir Isaac Newton, but in other important ways by scientists of the 20th and 21st centuries as our understanding of reality and our ability to observe it have developed.

1. **Ask a question.** It's not enough to just have a topic of interest; research relies on questions. Questions give you a focused reason for study, so at some point early in the process, you need to figure out what yours might be.

2. **Observe.** This means you have to start making observations about the world around you—both so that you understand the context for your question and so that you know what others have already discovered. It might be that your question has already been answered; it's only through reading what is already known, called conducting a literature review, that you will find that out. There's excitement in asking new questions that nobody has answered before, but keep in mind that how you observe—the order and method you follow—are of vital importance.

3. **Form a hypothesis.** Not all research involves hypothesis-testing. Some research aims at exploration or description, in which case steps 1 and 2 might be sufficient. But if you are trying to explain cause and effect, then generating a hypothesis is key. For purposes of research, a hypothesis is defined as an educated guess of the answer to your question, grounded in the observations you have completed. It's typically a testable statement of the relationship between 2 or more concepts, and it clearly expresses how you anticipate that they are related or impact each other.

In the third step, depending on your study, you might be making predictions about behavior that you can then test or you might start developing a theory that something produces a certain outcome. Other times you might not want to start predicting or theorizing until after you've completed your test, or multiple tests, and analyzed the results.

That's the main difference between 2 other common classifications of research: deductive and inductive.

- Deductive research starts with theories and tests them.
- Inductive research starts with observation and then builds theories from the results.

4. **Test your hypothesis.** This is the meat of research methods. In this step, you first have to design a good study to see whether your hypothesis holds water and then carry it out. That means choosing your methodology, figuring out how to measure your concepts and variables, identifying a relevant population and sample, gathering your data, and perhaps applying for funding. You have

to rigorously test your hypothesis, considering and evaluating any alternative hypotheses and explanations. Only if your hypothesis survives the testing process can you report with any confidence—although usually still with some level of uncertainty—that your initial ideas might have had some merit.

5. **Analyze your results.** Now it's time to analyze the data you gather and interpret it. Does it support or refute your hypothesis? Pay careful attention to data that contradicts your initial views; you might need to revise your hypothesis or theory or develop entirely new ideas. This is also where you want to consider the implications of your results, particularly for applied research purposes. It's at this stage that you figure out if you've actually found an answer to your question or if more work needs to be done. Typically, this is also where you discover the next 3 or 5 or 8 questions you want to answer, now that you've embedded yourself in this work.

6. **Communicate your results.** Research is all about communication. Sharing your findings is an essential part of the research process, for 3 reasons: It allows your work to undergo peer review, it might have a positive impact on others, and it helps you get simple recognition for the hard work of doing research.

> In research, it is always better to be clear about your uncertainty and to be honest and careful about the extent of your claims. If you overstate your findings, your work won't be as valued as if you report it factually, and it may be disregarded altogether.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, chs. 1 and 3.

Edmonds and Kennedy, *An Applied Guide to Research Designs: Quantitative, Qualitative, and Mixed Methods*, ch. 1.

2

Characteristics of Good Research

To evaluate research properly, you have to evaluate the research findings and the claims they make about how the world works. And to do that, you need to establish some criteria of good research so that you know what to look for when reading the work of others. Identifying those criteria will also help you know how to structure your research to ensure that it, too, is of the highest quality.

KEY CHARACTERISTICS OF GOOD RESEARCH

- While there are other characteristics of good research, the following 5 key ones can be reasonably applied to most fields, projects, and methodologies and offer a good start to understanding the fundamentals of how to approach a research project.
  - **Research should be systematic.** Research follows a set of sound procedures in the process of discovery and finding answers. Proper research has to have systematic procedures for a researcher to follow. Systematic research keeps you honest and ensures that you can stand behind the results you come up with. By using sound methods, you can demonstrate that your findings are not due to your personal preferences or laziness, but due to following a set, defendable process.

To make your research systematic, start by following the scientific method and ensuring that you have a solid research design. That research design will lay out the specific procedures you will follow in your work, such as an experiment, a survey, a case study, or an analysis of an existing database.

Correspondingly, when you evaluate the work of other researchers, you should look for a clearly outlined methodology section in their writing or presentation, in which they explain the process they followed to get their results. If there is no discussion of the methodology or if it seems very haphazard, that is a sign that the research was not conducted systemically and doesn't deserve your trust.

- **Research should be objective.** Researchers must be neutral toward their study and remain objective throughout the research process. If you start out wanting to prove yourself correct or certain that a particular point of view is better than another, then you are setting yourself up for biased results and, in turn, poorly conducted research. Everyone is entitled to their opinion, but research isn't about opinions. Sometimes you get results you don't like, and you have to be open to that. The reason is that research can be seen as a quest for truth. To the extent that an objective truth exists—a highly debatable prospect itself—that is what you seek. You are looking to find out the answer to a research question by observing the world around you. It's fine to start out with a guess as to what that answer is, but you must be open to the idea that your guess is wrong. Your quest is not to prove your ideas right, but to figure out answers to questions about how the world works. Only by aiming for objectivity can you achieve this.

One kind of research, known as hypothesis testing, aims at vigorously testing hypotheses in an attempt to prove them wrong. If you challenge your guess at every turn and it still holds up, then you can have some level of confidence that it might be correct. But if you go in with an idea of an answer and then either subject it to weak tests or, worse, look for evidence proving it correct, then you are not conducting research. You are cherry-picking data to support your biases or to make yourself look good. That's not good research.

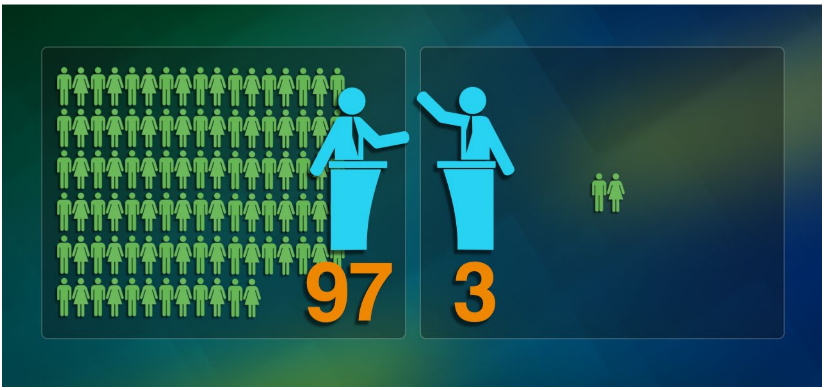
- **Research should be empirical.** Evidence should be grounded in observations and data. Research, fundamentally, is based on what you can observe in the world, not what you hope or wish to be true about the world. Your findings and conclusions must be based on an analysis of data that to the greatest extent possible represents an objective observation of the

When evaluating the research of others, you should pay attention to any conflicts of interest that researchers might have. If they are affiliated with a think tank or company, consider what impact that might have on their work. Their jobs and income might depend on producing a certain set of results, and this should be suspect. They certainly can still produce objective work—but you need to know about their potential biases so you can judge for yourself. The researcher should disclose any potential conflicts of interest so you can evaluate their methods and results with this in mind. Another thing to look for is charged language. If the language in someone's work relies on nonneutral descriptive terms, that may be evidence of bias and lack of objectivity.

For your own work, be honest with yourself. If you have a preference toward finding a particular answer or result, will you be willing to admit it if you turn out to be wrong? If the answer is no, then this might not be the best project for you. Starting out by trying to prove your ideas correct is going to lead to results that no one will trust, so it's best to focus on a question or project that is of great interest to you but whose eventual findings or answer you are neutral toward.

world around you. This isn't always easy. Some things you might want to observe you simply can't; other times human or technological failings prevent you from getting completely accurate observations. Research requires acknowledging and wrestling these limitations to acquire accurate observations about the world you can then analyze. This doesn't mean that your results will necessarily be consistent or that they will yield clear answers to your questions. There is often a high degree of uncertainty and ambiguity in what you do. Many of the things you study are going to turn out in a way you can't predict with any precision, at least some percentage of the time. But just because the data can't give you a definitive, foolproof answer doesn't mean that the research isn't accurate or useful.

- **Research should be cumulative.** Research builds on what other researchers have already discovered and helps build a scientific consensus. Research is an incremental process. You tend to want to answer the big questions entirely by yourself, but to do research well, you usually need to start small and work collaboratively with other experts. Research requires you to assess, critique, and build on previous work. If you don't acknowledge and build on earlier findings, your work will not be taken seriously. It's fine to critique or reject the work that has come before, but you still need to know it so that your



About 97% of climate scientists argue that climate change is a real, man-made problem. One of the grounds for this claim is a 2013 study of peer-reviewed articles that took a position on global warming. The study evaluated the abstracts of almost 12,000 articles written by 29,000 authors and published in 1,980 journals. Of those that took a position on anthropogenic global warming, 97.1% endorsed the scientific consensus.

A single paper or study claiming that global warming or climate change is real and manmade would not necessarily convince anyone to take action on such a complex global issue. But knowing that 12,000 articles claimed this is a much more persuasive claim.

audience knows how to situate your work with the other research they have read. And it is only by replicating and confirming previously published work that you can really come to a consensus about how the world works; a single study is not enough.

- **Research should be transparent.** You need to be open and transparent about all aspects of your research: the systematic methods you follow, any conflicts of interest, the empirical nature of your data, and how the work builds on and relates to other findings. Typically, this entails writing up your specific methodology and making your data available to others. This lets other researchers replicate your results; they can take your data and follow your procedures and should be able to come up with the same findings as you did. This keeps you honest as a researcher and lets others have more confidence in your work. Transparency ensures that research can be vetted before, during, and after publication. The norm of transparency ensures that research—which is often the basis of society's most important decisions—is based on genuine, accurate, and ethical work, even if it sometimes takes a while to root out work that fails to live up to that standard.

> Academics and scientists generally aren't trained to write for the public, yet true transparency requires that they communicate their findings not only to their peers but also to all interested and affected parties.

DETERMINING WHETHER GOOD RESEARCH HAS BEEN DONE

- How can you determine whether research has been done well or not?

  - **Make sure that the author has consistently and accurately cited his or her sources of evidence.** If the study attributes an asserted fact to what "some people say" but provides no quotations or citations, the author might be making an assumption rather than reporting a genuine finding. If the author refers to a study or an expert's opinion, there should be some kind of citation—even just a website or link—that lets you read the original source. Good researchers check their sources and cite originals, so if the citation record is spotty, you should question the work.

- **Consider the reliability of the author's sources of evidence.** Whoever wrote the study that the author is citing might have invented the information, creating what is now often called fake news. You may have to check the original source's citations to make sure they themselves are accurate. Make sure those studies aren't being misrepresented. It's easy to choose a chart, graph, or statistic from a larger study and manipulate it to tell the story you want to tell. If the original source is a personal blog, an opinion page in a newspaper, or some other form of commentary, then it may be unreliable; there may not be checks on that source to ensure its accuracy or objectivity. Be sure to watch out for any signs of ideological or other bias. And keep in mind that crowd-sourced cites like Wikipedia are also problematic; they may attempt to achieve objectivity by making themselves open to public scrutiny, but the information they provide is easily manipulated and may or may not be policed vigilantly.

- **Evaluate the nature of any experts that the author relies on**. Who are these experts? Do they have credentials in the specific topic at hand? Whom you count as an "expert" matters in terms of the results you get. When you are judging the merits of research, be especially wary of findings based on personal experience. We all tend to use our personal experience—or that of people around us—as evidence for some greater phenomenon. But that does not mean these experiences are representative on the whole of the outcomes experienced by the general population. It is very easy to fall into the trap of relying on what you have experienced and therefore think you know with certainty. Personal experience can illustrate a phenomenon, but by itself it is not evidence to be used in research. If you see a study that relies on a few first-person experiences to justify a finding, watch out.

- **Check the author's research to see how fairly it treats alternative claims and findings.** Does it conduct a rigorous test of those claims? Does the presentation leave room for the possibility that the author may be wrong? Or does the data seem cherry-picked to support a single conclusion? Strong research should give alternative arguments a fair shot and acknowledge the limitations and nuances of the author's findings and claims. People love for things to be binary—black and white, good and evil, good and bad research—but that isn't how the world works. We live in a world of nuance and subtlety, where every observation has qualifications and exceptions. If you see words like "always" and "never," or other language that consistently ignores nuances and presents findings in binary terms rather than as points along a possible continuum, you should be suspicious.

READINGS

Krathwohl, *Methods of Educational and Social Science Research*, ch. 3.

Little, *New Directions in the Philosophy of Social Science*.

3

Doing Research Ethically

Research ethics are the codes, norms, and principles of acceptable behavior for those who conduct research. Your task in research is to uncover new ideas and information, but at the same time, you are charged with making sure that the benefits of that new information outweigh the costs and that you do everything possible to ensure no one is harmed in the course of your research. It also means that you engage in honesty about your work.

THE NUREMBERG CODE

- Prior to World War II, there were very few federal regulations in the United States or widespread international principles regarding ethical research. The revelations of Nazi experimentation led to the first such set of regulations: the Nuremberg Code. These are 10 principles of human subjects research.

During World War II, the Nazis engaged in extensive experimentation on prisoners in concentration camps. They exposed people to frigid temperatures to check the effects of hypothermia; used toxic gases and chemicals on prisoners to test different treatments for chemical burns; and forcibly sterilized people to identify the most effective techniques to control people's abilities to procreate—among many other research wrongs.

1. Subjects must give their voluntary consent to participate in research.
2. Research should be for the benefit of society and not achievable through other means.
3. Experiments should be designed based on existing knowledge such that the anticipated results will justify the experiment.
4. Research should avoid unnecessary suffering and harm.

5. Do not do any research where it is known beforehand that death or disabling injury is likely, except perhaps if the experimenter is also the subject.

6. Risk should never exceed the "humanitarian importance of the problem" being investigated.

7. Preparation and proper facilities should aim at protecting subjects from even the remote chance of harm.

8. Only "scientifically qualified persons" should conduct experiments, and only with the highest degree of care.

9. Subjects should be able to end the experiment if they feel they cannot continue.

10. The researcher must be prepared to terminate the experiment if they have reason to believe continuation will cause harm to the subject.

- These 10 principles laid the groundwork for the protections to come. But ethical violations did not stop in 1947.

In 1964, the World Medical Association adopted the Declaration of Helsinki to establish ethical principles of medical research. It states, "While the primary purpose of medical research is to generate new knowledge, this goal can never take precedence over the rights and interests of individual research subjects."

THE BELMONT REPORT

- In the United States, the National Research Act of 1974 established the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, which commissioned *The Belmont Report* to "identify the basic ethical principles" for the conduct of human subjects research. The US department of Health and Human Services adopted the report's ideas as the Common Rule, the ethical principles regulating US research on human subjects.

- Issued in 1979, *The Belmont Report* is named after the Smithsonian Institution's Belmont Conference Center, where the initial discussions took place. It identifies 3 comprehensive principles of ethical research on human subjects.

  - **Respect for persons.** This means recognizing individuals as "autonomous agents" that have the ability to decide for themselves whether to participate in a research project. It also means that those who might not be able to act completely autonomously—children or those with "diminished capacity"—require special protection. How much protection is required will depend on the person and the potential harm of the study but should be determined with regard to this principle of respect.

  - **Beneficence.** Like the Hippocratic oath, this principle requires that researchers do no harm. Subjects must be protected from unnecessary risks of harm, including physical, mental, psychological, social, economic, and legal harms. Additionally, beneficence requires that research maximize the general benefits to society and minimize harms to individual subjects.

- **Justice.** This final principle recognizes the long history of research that used the poor and disadvantaged for subjects, exposing them to harm while doing work that would ultimately benefit the wealthy or advantaged. Justice, then, calls for fairness in terms of access to research and its benefits as well as an equitable distribution of the potential risks to individuals.

- Drawing on these 3 principles, *The Belmont Report* generated a set of applications that would be required of researchers.

  - **Researchers must solicit informed consent of their potential subjects.** Subjects must be given enough information about the project's purposes, procedures, risks, and benefits to make an informed decision about whether they want to participate. This information must be distributed in such a way that the potential subjects can genuinely understand what their participation entails. Those unable to provide consent may be able to do so if a third party is able to act in that person's best interest and potentially provide informed consent on their behalf. And as always, special consideration must be given to vulnerable populations.

  - **The proposed research must be justifiable as maximizing societal benefits and minimizing risks.** In other words, there must be value to society for the research: You can't experiment on people purely to satisfy your own curiosity or to gain personal benefit. All kinds of harm need to be considered—not just physical harm, but also psychological, mental, legal, economic, social, and reputational harm. This entails protecting the identities of your subjects and even keeping the fact that they participated in your study confidential. You may need to have procedures for

> Essentially, informed consent is about making sure that subject participation is genuinely voluntary: Participants must be able to choose to be involved, and they also must be free to withdraw their participation at any time without facing consequences for doing so.

Sometimes you might not want your subjects to know everything about your study before you start, because this might influence how they respond in your experiment.

Deception is sometimes necessary for research to work. The *Belmont Report* says that when deception is needed for the research to be valid, the subjects still need to know of any potential risks. If the deception poses additional risks, that can't be withheld from them. You also must debrief the participants at some point and tell them about the deception.

securing your data, particularly if it contains identifying information. If your research does pose a risk, or is on vulnerable populations, then you must be extra cautious.

- **There must be fair procedures and equitable outcomes in how subjects are selected for research.** You can't offer the benefits of your research to particular people or groups and deny them to others on the basis of personal preference. Justice requires that if certain populations are overly burdened and the research you wish to do could pose additional harm in those areas, then less burdened populations should be called on first as subjects for the research. As always, vulnerable populations deserve special attention and should only be included in the research if their participation is absolutely necessary for the study's success.

- *The Belmont Report* is an important milestone in the establishment of ethical principles for research, but it (along with the government's Common Rule) applies only to the United States. Research outside the US may have different rules, so if your research is international, you

Many US-based pharmaceutical companies have moved their clinical studies overseas because it is cheaper and easier to find participants. And while they are still supposed to comply with US laws, that doesn't always happen. It's not always clear if every regulation applies if it differs with the law in another country. And in some cases, the rules may represent a culture clash.

need to consider the rules in your host country, as well as the potential benefits and harms that might be unique to that local population. Also, just because some practices are permitted by law, that doesn't mean they are ethical.

Follow the principles of respect for persons, beneficence, and justice regardless of where you conduct your research—but realize that those principles may entail additional protections depending on where you are.

ETHICAL BEHAVIOR OF RESEARCHERS

- Regardless of the type of research you do, you must consider how to behave ethically as a researcher.
  - **Don't make up data.** Falsifying or distorting data to make your results look better or support a story you want to tell is an incredible ethical violation. Don't put your personal gain above those you study. One way to avoid this is to craft your studies so that no matter what the data show, you have something interesting to say. This will limit the temptation to fabricate results.
  - **If you have any conflicts of interest or reasons for bias, disclose them.** It is important to be honest about any commitments in your life that might prevent you from being fully objective. Always acknowledge any sources of funding for your work so that your audience can make their own determination about whether this might cause bias in your work.
  - **Be sure to properly attribute and protect the intellectual property of others.** If you use any words—or, perhaps more importantly, ideas—of another researcher, you must give that person proper credit. Cite thoroughly and often; you never want your reader to have to guess which ideas are yours and which you borrowed. Be clear in your own head about your own contributions and make sure you properly give credit to others.

INSTITUTIONAL REVIEW BOARDS

- Research in the United States on humans that is conducted by the government or any entity that receives government funding, directly or indirectly, must be approved by an independent ethical review board, usually called an Institutional Review Board (IRB), whose job is to make sure that the research you want to do follows the principles of *The Belmont Report*.

- In 1981, US federal agencies started requiring IRBs to engage in oversight of research. IRBs can be based in universities or other institutes of research, or they can be independent or focused on commercial research. All must be registered with the federal government. IRBs are not restricted to the US, however; they are found all over the world, although the specific regulations may differ by country.

- Not every researcher necessarily needs IRB approval. If you are doing a personal project for a local organization and want to conduct a survey of your membership, you probably don't have to get IRB approval first. But that doesn't mean you are free to violate the principles of *The Belmont Report*. Always take care to protect the rights of your subjects, even if you don't have to get permission first.

> If you want to do any research on human subjects and your work is in any way funded by the US government, you must have IRB approval before you start your research.

- Some categories of research are exempt from IRB approval. These include some educational research, research involving publicly or anonymously available records, and research evaluating public programs, as well as a few other areas that are deemed to be very low risk. However, you don't get to decide that your research is exempt. Unless you're doing research that obviously needs no approval, such as a personal project for a local group, you still have to submit an application to the IRB. They are the ones that will determine that your research is exempt.

- You aren't allowed to begin data collection until you have IRB approval. You aren't allowed to have any contact with your subjects until you've convinced the IRB that you are aware of the potential risks your subjects may face and that you are prepared and able to protect your subjects from harm, including psychological, emotional, and reputational harm.

- Once you file your application, it will be reviewed by the IRB and designated to one of 3 categories: exempt, expedited review, or full board review.

  - **Exempt research** is that which by its nature imposes no foreseeable risk to subjects.

  - **Expedited research** poses minimal risk to subjects, meaning that the harm they face is no greater than that which they might experience in their normal, daily life.

  - A **full board review** covers everything else, including anything that involves intentional deception, invasive procedures, sensitive or stressful topics, or potential for more than minimal harm to the subjects.

- Regardless of the level of the review, the IRB will evaluate the research proposal to make sure that risks to subjects have been minimized, that the researchers are ready and able to care for their subjects and their data to ensure minimized harm, and that any potential harm is outweighed by the potential benefits of the research.

If you violate the basic ethical principles outlined in this lecture, consequences can vary. If you've published your work, it may be retracted. You or your institution might lose federal funding. If you violate ethical principles after an IRB has approved your research, the IRB may lose its standing and ability to grant approval to other projects. You could be reprimanded, suspended, or fired. Certainly, your reputation will take a hit.

READINGS

Granberg and Galliher, *A Most Human Enterprise.*

Krathwohl, *Methods of Educational and Social Science Research*, ch. 10.

Nakray, Alston, and Whittenbury, eds., *Social Science Research Ethics for a Globalizing World*.

National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, *The Belmont Report.*

Zimmer and Kinder-Kurlanda, *Internet Research Ethics for the Social Age*.

4

From Topic of Interest to Research Question

Most research starts with a topic. But while starting with a topic is fine, you should not end with a topic. Ultimately, you need to come up with a question that is worth answering. Moving from a topic to a question is an important step in the research process.

SELECTING A TOPIC

- How do you go about selecting a topic in the first place? Sometimes a topic is chosen for you. You might have been asked by a supervisor to evaluate a particular program. Colleagues may have brought you in on their project, or a client may ask for assistance in solving a problem. But what if you need to do research and produce a paper, presentation, talk, or poster; you have complete control over the topic; and you don't know where to start?

- The best way to start is to think about something that interests you or your intended audience. Whatever topic you choose, all things being equal, you want it to be something that you genuinely want to explore in great depth. Otherwise, you might find yourself prone to procrastination and lackluster effort.

- If nothing comes to mind immediately, then try a quick exercise. Take out a piece of paper and make 2 columns, one of which you label "topics I know a lot about" and the other you label "topics I'd like to learn more about." Write down as many as you can think of in both columns. Be as broad or as narrow as you like, and write down anything that comes to mind; this is a brainstorming session, so don't censor yourself right now. Then, see if there are any natural connections between any 2 items.

- If you still are having trouble finding something, then look to recent research in your field. Skim through the table of contents in academic journals, a conference program, or the recent publication list of some publishers. See what kinds of topics are pursued by recent authors and note which ones sound the most interesting to you.

- If you really find yourself struggling to find a general topic, you might want to jump straight to a research question, as you might find that easier.

CHARACTERISTICS OF GOOD RESEARCH QUESTIONS

- While the specifics may vary from one field to another, good research questions tend to have 3 main characteristics: They are unanswered, appropriate in scope, and empirical.

What constitutes a good research question can depend on your discipline and field. Many projects call for describing historical events in detail. In other projects, however, you might want to focus a description of events on causes and explanations. In such a case, your question should not ask *what* happened but *why* it happened.

- **Good research questions are unanswered.** Research—whether it is scientific, historical, journalistic, or something else—aims at producing new, original knowledge or answers. That new knowledge might be based on original data or new interpretations of existing data. As you explore the literature, you may discover that someone has already answered your question. That may mean you need to find another one, but just because someone else has written one answer to your question doesn't mean your question has been definitively answered. There is lots of room for debate in research-based fields. Read the other researcher's work and evaluate it. You may find that you disagree with his or her assumptions or conclusions. Maybe his or her answer applies in some cases, but not yours. All this means is that your area of interest is further along in the research process than you thought—and your incremental contribution starts a bit further down the line. The idea that good research questions should be unanswered means that your question should be about something that doesn't have an easy, factual answer. Also

make sure that your question allows you to enter a debate, solve a puzzle, fill a gap in knowledge or understanding, solve a problem, or otherwise make a contribution to your audience. The best way to do this is by doing a literature review, which basically means you need to read through what other scholars have already written on this subject so that you can figure out where your ideas can fit in.

It's normal to start with answered, factual questions so you can gather the information necessary to ask a good, unanswered question.

- **Good research questions are appropriate in scope.** Sometimes you need to adjust the anticipated product to meet the scope of your question. Sometimes one research paper becomes 2 or a program-wide evaluation spurs into individual evaluations that are narrower in scope. If this happens, make sure that changing the ultimate product is fine with the editor, client, supervisor, or whoever else is expecting it. If it's not, you might have to limit your approach to the expected product or adjust the size of your product so you have the space to consider all aspects of your question without sacrificing necessary detail. Another aspect of scope has to do with considering your own abilities and limitations. You need to think about the kinds of data that you would need to answer your question. Does it exist? Do you have the time and resources to acquire it? Do you have the skills to interpret it? You have to consider your training, skills, and resources. Time is always a factor: You may have a set deadline and want to make sure whatever question you choose is one that can be answered in the time frame you have. Other factors to consider include whether or not your project requires extensive work with numbers or people; you may have to adjust your research question if you dislike interviewing strangers or if working with numbers scares you. Finally, is your question going to require funding for you to be able to complete the project? Projects that are large in scale or require specialized equipment or personnel often need grants.

- **Good research questions are empirical.** Empirical research questions ask how the world works. They are based on events, phenomena, and actors that can be observed in the world. While empirical work is about objective processes that aim at observing how the world actually works, normative questions and claims are subjectively based judgments about how you might want the world to work. Normative questions are those that proscribe or judge behavior. By their nature, these questions are asked from a subjective standpoint and tend to produce subjective answers. This is fine in your everyday life. But when it comes to research, it can be a problem. If you base your findings on what you hope to be true or what you think might be good or bad, then you are likely going to cherry-pick information to support your own ideas and conclusions. It is also very difficult to provide evidence

A norm is a shared code of behavior. It's a set of usually unwritten rules a group has for interacting. All members of the group know the rules and often don't even think about them even though they regularly obey them.

There are norms about everything—behavior in bathrooms, eating, standing in lines, greeting people, and much more. You can violate norms, but there may be social, if not legal, consequences for doing so. Norms change by location, culture, group, and time.

for a subjective statement. None of this means that normative questions are bad. Some fields, such as ethics, focus primarily on normative questions. But in terms of using the scientific method, you cannot focus solely on normative questions because you need to make observations about the world—in other words, engage in empirical work—to get data. Normative questions are often essential to motivating your work, but to answer these questions, you have to ask empirical questions, too. Only after empirical research can you answer the normative question.

Plenty of research projects aim ultimately at making predictions about the future, but to do that, you usually need to understand the world of the past and present; in other words, you need to do empirical work that allows you to make those predictions.

Ask normative questions, as they motivate your work and help you develop recommendations for action, but then move quickly to the empirical question that will allow you to effectively answer the normative question. That is essential to solid scientific research.

TIPS ON WRITING A GOOD RESEARCH QUESTION

- **Start your question with the 5 Ws and H: who, what, where, when, why, and how.** *Who*, *where*, and *when* tend to be more sparsely used, as these might lead you to ask previously answered, trivial questions. But for comparative, action, or evaluative research, these can work just fine. For example, ask, “Who are the people most harmed by this policy?” *Why* and *how* are the best for asking questions about causes and outcomes. *What* is a great starter for questions about policy, practice, and scope. For example, ask, “What kind of policy might solve X problem?”

- **Try to avoid yes/no questions.** The key to all of these question starters is that they are hard to answer with a simple yes or no. Yes/no questions are fine in some situations but can often lead you down the path of trivial answers. Typically, once you know that an answer is yes or no, you immediately want to know why. So, instead of asking, “Is a carbon tax the most effective policy for addressing climate change?” you could ask, “What is the most effective policy for addressing climate change?” Then, no matter what the answer is, you have something interesting to say. That also helps you avoid ethical issues about wanting to try to prove a particular answer correct.

- **Don’t make assumptions about the answer.** Avoid writing a question that presumes a specific answer. For example, you could ask, “Why are eggs a healthier breakfast option than cereal?” But that presumes that eggs *are* healthier. Depending on what you mean by “healthier,” that may or may not be true. Instead, ask, “What is the healthiest breakfast food option?” Eggs might be the answer—but you aren’t presuming that from the start.

- **Don't complicate things unnecessarily.** Your question might be "Is my program meeting its outcomes?" or "What are the causes of this phenomenon?" You might revise your question later to be more specific, but you don't have to write the perfect question from the outset. Do the best you can, but get something down on paper so you can start doing a literature review. You will have plenty of opportunities to revise your question as you learn more. Remember, it's better to answer a narrow question well than answer a large question poorly.

- **Use the literature.** The scholarly literature on a topic is a great resource. A lot of scholarly works will end with the authors suggesting questions for future research. You can look to those for ideas on what your questions should be. The work of journalists, policy makers, and entrepreneurs may also inspire you.

READINGS

Henderson, "Norms."

Krathwohl, *Methods of Educational and Social Science Research*, ch. 5.

Powner, *Empirical Research and Writing*, ch. 1.

5

What's Already Known? The Literature Review

The literature review, often referred to as the lit review, is where you dig deep into what scholars and other experts have already learned on your topic. Then, you can build your work on top of it. This lets you add to the conversation with the assurance that you are making a genuine and valued contribution.

WHAT TO LOOK FOR

- Research is conducted at least twice in any study. The second time is when you get your actual data—the statistics, surveys, experimental results, reports, or historical analysis that will let you assess your claims. It occurs much later in the process, after you've designed your entire study. The first time is when you review the scholarly literature on your question and find out what is already known on the subject.

The body of scholarly work on a given question or topic is called the literature. It's the work that scholars and scientists have completed and published in a particular area.

A literature review, then, refers to both the process of finding and evaluating this body of work for your chosen topic or question as well as the section of your report or presentation where you share your conclusions about the literature. First, you find the literature, read it, and then draw conclusions about what you do and do not know. Later, you will produce a section of your report—written or oral—that explains the key claims of the literature: the themes, debates, gaps, methods, and overall conclusions drawn from this review of scholarly work.

- Conducting a literature review—and demonstrating you have done so by including it when you share your work—is required to have your work taken seriously by the research community.

- You need to understand what ideas are out there and their strengths and flaws before you are able to advance understanding of the world. If you don't do the literature review, then you don't even know whom you are challenging.

- There are a number of practical things you can learn from reading the work of other scholars that will help you build your own study. You can learn where mistakes were made and identify best practices that will help you build your research design. Specifically, you will find common and accepted definitions for the concepts and variables you plan to use. You will learn which concepts and variables are important in the first place. You will see which cases have been studied and which haven't—perhaps providing a clue for where you can make a contribution. You'll learn what kinds of qualitative or quantitative methods are generally employed to study this question and what sources of data are out there. You might even find an unanswered research question or untested hypothesis that you can tackle.

> Many of the questions you might have about designing your study can be answered in a thorough review of the literature.

- Reviewing the literature also helps you in bigger-picture tasks, too. Collectively, the literature tells you about the state of theory and practice in this particular area. It can help you identify the debates scholars have, the scope and limitations of existing theory, unexplored gaps of understanding, practical examples where policies and programs have or have not worked, and connections to other fields or areas of study. A thorough read of the literature is what starts many researchers on their projects; they see something that other scholars have missed or a way to resolve an existing debate, and that's their point of entry into the discussion.

HOW TO FIND THE SOURCES YOU NEED

- Scholarly sources are the key to any literature review. A scholarly source is a book or journal article that is written by an expert, is written for other scholars, and has undergone peer review. In other words, other experts have evaluated the work and deemed it worthy of publication, usually in a double-blind process, which means that neither the author nor the reviewers know the identities of those involved. The goal is to ensure that the work is evaluated based purely on merit.

Typically, nonscholarly sources are avoided in the literature review. A nonscholarly source is a book, article, or other source that has not undergone scholarly peer review. Examples would be a newspaper article, magazine, blog, social media post, or self-published book. Even if the author is an expert, if the source is not peer reviewed, it's not typically considered a scholarly source. Some of these sources can still be useful, but they are only rarely considered part of the literature.

- These 3 criteria are used to identify a true scholarly source.
    - **Scholarly sources are written by experts.** Look at the author's credentials. The author will typically hold a terminal degree in the field—that is, the ultimate degree that one can obtain—or be in the process of acquiring one. The author also will usually have an affiliation with a university, think tank, or reputable research-based agency or organization. If you can't find any information about the author's credentials, or they don't meet that level, then it's probably not a scholarly source.
    - **Scholars write scholarly sources for other scholars.** If the intended audience is the public, students, government officials, company executives, or friends and family members, then it's usually not considered a scholarly source. If there's a lot of indecipherable jargon and charts; few pictures; no colorful, glossy paper; and citations and footnotes galore, then you've probably found a scholarly source. This will vary by discipline, but scholarly sources generally have a high bar of entry for the average reader.
    - **Scholarly sources have undergone peer review.** A good way of determining whether this is the case is by examining the publisher. Is it a university press like Princeton, Oxford, or Stanford? That's usually a good sign. Likewise, an academic journal such as *Chemical Reviews* will conduct peer review of all submissions. If you review the publisher information, it should have a clear section that discusses its review process.
- All 3 criteria must be met for a source to be appropriate for the literature review.

WHERE TO LOOK FOR SOURCES

- One way to find the sources you need is to find just one or 2 highly relevant and recent journal articles on your topic. As previously mentioned, scholarly articles are usually full of citations and footnotes, so why do the work of tracking down a ton of citations when other scholars have already done that work for you? Find one or 2 really good, recent articles on your research question and you've got the key to the core of the literature. Go to the bibliography and track down the articles there. Then, do the same with *those* articles. Keep going, and note which articles keep popping up in the bibliography. The ones that keep showing up are likely the core of the literature on the subject.

Once you start doing a lot of research in a particular area, you'll get to know who the big names are and which articles or books are considered the most central to the current debate. But when you are just getting started in a new area of research, this snowball method of finding sources is really useful.

- Another thing you can do is check the number of citations for a given article. Google Scholar will report that information if you do a search using the article's title. A high citation count means that the article has been consistently cited by other scholars in their work—a good sign that you've found a core part of the literature.

- Another option is to ask a mentor. Your mentor may already know the big names in the field and can direct you to some of the core works you need to know.

- To find the one or 2 articles in the first place, you have a few options. You can head to your local university library, if there's one near you, and browse the stacks of bound journals. If you go to the website for the professional association in your field, it should identify some of the top journals in your discipline. You could pull out a recent edition and start browsing until you find a relevant article.

- Searching databases on the internet might be quicker, though. Try a catchall database like EBSCO, Academic Search Premier, or JSTOR. Enter a few relevant search terms and narrow the responses to scholarly sources. You can use the provided subject headings in an article's description to further narrow your results.

- That's great for anyone with access to a university library, but many people don't have that option. Still, you'll be able to find some sources available through free search databases, such as Google Scholar. There are also subscription services that let you rent journal access on a monthly basis, such as DeepDyve, or ones like Academia.edu that allow authors to upload their papers. Your public library may have some resources, and it's possible that you may have alumni access privileges at an institution you previously attended. Some journals, particularly those in the natural sciences, have moved to open-access formats, allowing free public access to their publications.

WHAT TO DO WITH YOUR SOURCES

- Journal articles can seem difficult to decipher at first, but they follow a fairly standard format once you know what to look for.

- In August 2017, the journal *Science* published an article called "Protecting Unauthorized Immigrant Mothers Improves Their Children's Mental Health." The authors ask their research question in the first paragraph: They want to know the impact of a parent's unauthorized status on a child's well-being. The last sentence of the first paragraph begins the literature review section of the article, as the authors note that their study is filling a gap in existing literature. The literature review continues for the next 3 paragraphs, as the authors note relevant studies that connect parental immigration status to child development and note the methodological issues that have prevented a full understanding of this question. They then outline the nature of their study—the subjects, sources of data, specific variables used, method of analysis—before turning to their results. They close with the implications of their results and possible steps for future research.

- It's important to take notes during this process so you can find your way back later to any sources you found and any important ideas that occurred to you along the way. First, before you write down the source's research findings, note its bibliographical information as well as the page or paragraph number of any material that interests you. If you want to save yourself time later, upload the information into a citation manager system—now included in many word processing programs. That will create a bibliography with a single click. But for now, just make sure you know exactly where each idea and finding came from so you don't have to go back and look it up again later.

- Next, for each article or book, take notes on its claims, research design, and implications. Note exactly what the authors claim to contribute as well as the details of their research methodology used to evaluate those claims. Try to paraphrase whenever possible. As you read, you may question the process or results, particularly as you comb through multiple articles on the subject. Note those issues, too. Also note any connections or contradictions to other articles you've read. At this stage, it is really important to clearly distinguish between what the authors are saying and *what you think about* what the authors are saying.

Doing the literature review up front can save you a ton of time and frustration later.

- With the *Science* article, you would note the full citation and then mark the research question, the gap it claims to be filling, the methodology the authors used, and the key finding. If you have any questions, ideas, comments, or connections to note, put those in your notes as well, but use a different color, highlight them, or bold them to make it clear that it is your analysis and commentary and not what's found in the article itself.

- Repeat this process with all of your sources. Depending on the size of your project, you may consult 15, 50, or 100 or more sources. You want to be comprehensive; use the sources you are reading as a guide. If they are citing an average of 25 sources, then that's a good number to aim for.

HOW TO DRAW AND PRESENT YOUR CONCLUSIONS

- The final step is to draw and eventually present your conclusions about the literature. Remember that the literature tells you about the state of knowledge on your chosen topic. That means the point is not simply to report that scholar X said this and scholar Y said that. A list of sources and their contribution and findings—the notes you just took—is called an annotated bibliography. It is a source-by-source list of the important characteristics and findings of each book or article. It is an initial first step to writing a literature review, but the literature review itself requires you to go further.

- Instead, you need to identify the core findings in the literature. This means you have to explain what is known about the answers to your research question. This might be consensus on a set of definitions, or a methodology that scholars tend to use to study the question, or agreement on which range of theories are most germane to the subject. But you also have to explain what is unknown. If everything is already known, then there is no need for your project.

- There are a lot of comparisons to make as you synthesize your sources and write your literature review. You might look for common themes across the sources that keep popping up, or you might look for gaps—issues or ideas that the authors seem to miss but that you think are very relevant and perhaps worth exploring in your own project.

- Another way to organize your thoughts is to look for debates between authors. Where do they disagree, and is there room for you to enter the debate with your own contribution? Are the different theoretical perspectives you encounter in contradiction to each other? If so, that might be a way to organize your review of the literature.

- One last thing to look for are methodological choices and debates. You might note that the dominant methodology used to study similar questions to yours is quantitative—which means that a qualitative approach might provide new insights. This means that a literature review is not simply a paragraph about what each author has to say. Instead, you should focus your writing by one of those methods, using themes, gaps, debates, or methodology to organize your thoughts. You cite sources as a type of evidence to support your argument that this theme, gap, debate, or methodology is a useful way of understanding the current scholarly approach to your topic.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, ch. 4.

Garrard, *Health Sciences Literature Review Made Easy*.

Powner, *Empirical Research and Writing*, ch. 3.

Walliman, *Social Research Methods*, ch. 5.

6

Generating Hypotheses and Theories

Generating hypotheses and theories is typically the third step in the process of doing research after identifying a problem or question and reviewing the literature. At this point, it's time to start considering possible answers.

THEORIES

- Theories are generalized explanations for what we observe in the world. They play an important role in driving basic research. Observation tells us what to expect. We all know that what goes up must come down. Theory helps us understand *why* that is the case.

- Research isn't always about building or testing theory. Sometimes you just want to observe or describe, rather than explain or understand. Sometimes, as in action research, your goal isn't to explain broader patterns but to find solutions for specific people, groups, or organizations. But a large swath of research is focused on explanation. And frequently, understanding *why* can help you apply ideas to new cases and events—and even let you make predictions. Any time you are interested in why or how things happen or want to fit an event into a larger pattern or trend, you are going to want theory.

- Theories have to be tested by data. While you can use inductive reasoning to form theories from observation and data, there are dangers if you stop there. It can lead to data fitting—basing your theories on the data you have, which may not be comprehensive. Instead, you observe, form theories based on those observations, and then test those theories against new data.

- Parsimony is valued in theories. This is a quality drawn from the Occam's razor principle: that the simplest explanation is usually the best. Parsimony means that when everything else is equal, simpler explanations are preferred to complex ones. The idea is to maximize the story that a few variables can tell. If you can explain some outcome using just one or

2 variables, that is considered a stronger theory than if you need 10 or 12 variables. But you don't want to oversimplify and lose the causal power of your theory. If the explanation really does require those 10 or 12 variables, then it's better to keep a complex-but-accurate theory than to go with a simpler-but-less-accurate one.

- To develop a theory, start by thinking systematically about how and why one variable of interest affects another variable of interest. Theory is often about unwrapping the causal mechanisms that get you from point A to point B.
- To develop your theory, first look to the literature. See what kinds of explanations are already offered and examine whether the evidence in the literature supports those explanations. Are there gaps that aren't explained? Cases that seem to contradict the general findings? Debates that are not yet resolved? All of these are fertile grounds to spark your own ideas.
- Another way is to engage in some observation. At an early stage of your research, examining data can be a useful way to generate theories as well as hypotheses. Eventually, you will want to subject those theories and hypotheses to proper tests, but initially you need some knowledge on which to base your theories.
- The key is to ensure that your theory helps answer your research question, aims at explaining general principles—not just specific cases—and advances understanding of the phenomenon of interest.

HYPOTHESES

- Hypotheses are testable statements that provide the researcher's best guess at an answer to a research question. Hypotheses are typically derived from theories, although sometimes it works in reverse and testing hypotheses helps researchers build theories.

In science, researchers set out to disprove, not prove. When you prove something to be true, that means it's final and definitive. In many research areas, almost everything is uncertain and conditional. Researchers are rarely 100% positive about anything. You find evidence that supports a theory or hypothesis, or refutes it, but there is no single piece of evidence that can prove your ideas correct. Instead, you set out to disprove ideas. It's what you are left with—the ideas that have been tested but not disproven—that form the foundation of scientific understanding.

Most research is actually testing what is called the null hypothesis rather than a hypothesis itself. Every hypothesis has a null hypothesis. A null hypothesis simply states that no relationship exists between the variables. And that is what you are actually setting out to disprove.

If you can disprove the null hypothesis, then that means that some kind of relationship does exist—perhaps the one you hypothesized or perhaps something else you weren't expecting.

- If in your study you find evidence that supports your hypothesis, note that this does not mean that you are automatically correct. You may be right, but you have not proven your case.
- Why is it that if you find evidence to support your hypothesis, you shouldn't assume your hypothesis is definitely correct?
  - It's possible that it's only correct for whatever data you looked at. It might be that if you had more data—or data from different sources or data over a longer time frame—the results would be different. Your data might be incomplete, missing, or flawed.
  - There might be alternative explanations that account for the relationship you suggested.

Theory and hypothesis intersect closely. Theory, by increasing your understanding of why and how things happen—and sometimes the causal mechanisms underlying the why and how—can also help you assess your hypotheses and findings.

HOW TO WRITE A STRONG HYPOTHESIS

- Some research focuses just on developing theories—and that's fine. But ultimately, if your goal is to advance knowledge or to be reasonably confident that your ideas are correct, you need to examine empirical evidence. That doesn't always require a hypothesis to test; sometimes you are looking for themes, or describing your findings, or engaging in critical analysis.
- Other times you are doing research to figure out the variables that might play a role in affecting your outcomes of interest. You can't really write a hypothesis, because you don't yet know what variables to use. This is completely reasonable; hypothesis testing might come later, or not at all.
- So, if your project doesn't lend itself to hypothesis testing, that's fine, but a lot of research does involve constructing tests to evaluate hypotheses. And having a hypothesis can be an advantage, because it provides guidance for your research. Just as a research question provides more guidance than a simple topic, a hypothesis can help guide you toward a specific research design and provide a framework for your analysis.
- If your research is focused on developing and testing hypotheses, consider these 4 rules for how to write a strong hypothesis.
  - Hypotheses are typically **probabilistic**. If you state a hypothesis in an all-or-nothing sort of way, then there's no room for nuance, random chance, or exceptions. To write hypotheses probabilistically, that usually means using words like "more likely" or "less likely" rather than "always" or "never."

- Hypotheses are written in a **generalizable** way—that is, in such a way that they apply to broad groups or concepts, not specific ones.

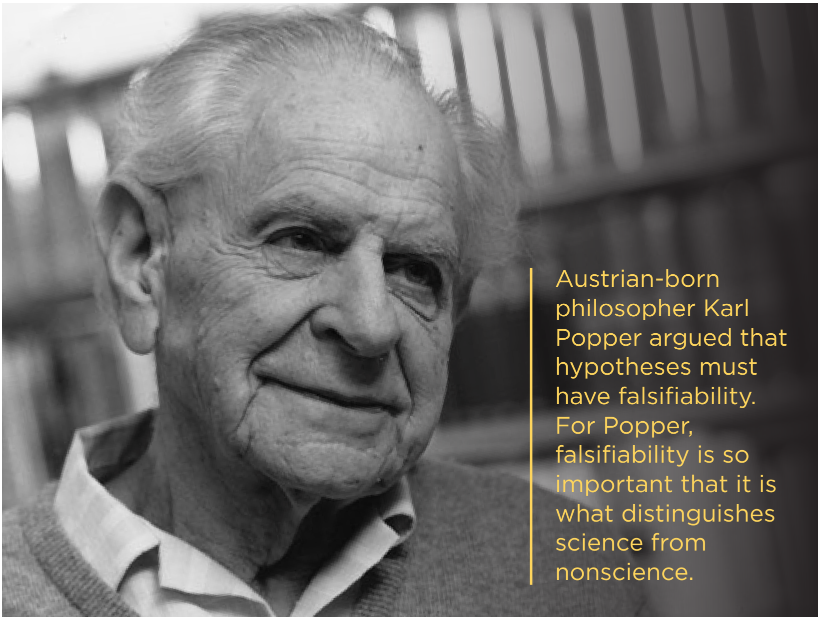
- Whenever possible, hypotheses should **state a specific proposed relationship between variables**. This means that your hypothesis should specifically state something you expect to find when you examine the empirical evidence.

There are generally 2 broad categories of relationships: correlation and causation.

- In a hypothesis that focuses on correlation, you are stating that you expect to find a relationship of some kind between 2 variables. You might indicate what kind of relationship you expect to find. Do you expect that as one variable increases so does the other? Or do you expect the second variable to decrease?
- In a hypothesis that focuses on causation, you are investigating whether or not one variable causes change in the other variable. In other words, you aren't just looking to see whether there are patterns in the values of 2 or more variables. You are looking to see if, specifically, change in one variable causes change in another.

The variables that you think are affecting some outcome of interest to you are called **independent variables**, usually referred to as *x*. In an experiment, *x* is the variable you are manipulating. For example, it is the drug that you are giving to subjects in medical research.

The other type of variable—the outcome, or effect—is called the **dependent variable**, usually referred to as *y*. This is whatever phenomenon you are studying—the thing that is changing and you want to understand why it is changing. In a study where you administer drugs for medical research, *y* is whether or not the medical condition improves.



Austrian-born philosopher Karl Popper argued that hypotheses must have falsifiability. For Popper, falsifiability is so important that it is what distinguishes science from nonscience.

- Strong hypotheses should be **falsifiable**; that is, they are written in such a way that they can be disproven.

- There are a few templates you can use to construct your hypotheses that follow these 4 rules. They won't fit for everything you want to study, but they can be a good help to get you started.

  - **Value 1 of *x* is more likely to lead to value 1 of *y* than value 2 of *x*.** This template says that one category—or value—of one variable, *x*, is creating a particular effect on a second variable, *y*, and some second category of *x* is not having that effect. You are stating a specific relationship between the variables: x_1 is having this effect, but x_2 is not. Both x_1 and x_2 are values on your independent variable. This clear relationship gives you something to test. Sometimes you have more than one *x* to consider; you can always add more *x*'s into your template.

- **There is a [ ] relationship between *x* and *y*.** This template is easier to write, but you are more restricted in when you can use it. Fill in the blank with "positive," "negative," "curvilinear," or other descriptors of the relationship and you are done; there is no messing around with values.

A positive relationship is one where the 2 variables vary in the same direction: As one goes up, the other goes up—and as one goes down, so does the other.

A negative relationship is one where the 2 variables vary in opposite directions: As one goes up, the other goes down, and vice versa.

  - There are 2 restrictions to using this template. First, these kinds of hypotheses only establish correlation, not causation. If you just want to test whether 2 variables are related to each other, then this can work fine, but if your goal is to figure out if one causes the other, this hypothesis style doesn't clarify that for you. Second, for this style to work, your variables need to be at a certain level of measurement; that is, it needs to make sense that a variable can go up or down—increase or decrease. Some variables you may want to study don't make sense in that way.

- There are plenty of other ways to write hypotheses. Don't feel bound to these templates. But when you are just getting started, it helps to have a format to follow, so use these as a starting point.

Science in theory and science in practice can differ widely. Researchers set out to disprove theories and hypotheses and design tests based on hypotheses. In the real world of research, though, this doesn't always happen; there are a lot of incentives in place to not do this.

For example, it's much more difficult to publish negative results than positive ones. In other words, if your evidence confirms your null hypothesis and rejects your hypothesis, that is very important to know—and exactly the kind of falsifying that Karl Popper would applaud. But it's not as interesting or appealing as results that support a hypothesis, and therefore it is much more difficult to acquire grant funding for such research or to get it published.

It's also true that sometimes scientists will just run various models on their large data sets and then when they hit on a finding, pretend that this was their hypothesis all along. This can lead to data fitting, and it doesn't necessarily advance the state of knowledge. But it can be an effective way to get results that can be published. And for many researchers—particularly academics at big research universities—getting published is one of their primary goals. Their careers depend on it.

There are strong reasons to follow the rules of scientific inquiry when it comes to research. Ethics demand it, and for many of the projects you are doing, it is just as important to know what doesn't work as what does. There are always going to be incentives to avoid or bend the rules. Resist those incentives.

READINGS

Powner, *Empirical Research and Writing*, ch. 2.

Thornton, "Karl Popper."

Walliman, *Social Research Methods*, ch. 6.

7

Selecting a Research Design

The design of your research procedures encompasses your overall approach to research as well as the specific components of how it will be carried out. There is a wide range of approaches to research design, and there are some key factors to consider when choosing an overall approach for your project.

There are many ways of categorizing different research methods, but a straightforward and common way of organizing these methods puts them into 2 categories: quantitative and qualitative.

- **Quantitative analysis** generally involves using statistical tools to analyze large amounts of numerical data on a large number of cases. Quantitative designs tend to produce data useful for quantitative analysis.
- **Qualitative analysis** typically looks at a smaller number of cases more in depth, using data that can't always be reduced to numbers. Qualitative designs tend to produce data useful for qualitative analysis.

QUANTITATIVE APPROACHES TO RESEARCH

- **Quantitative approaches** include experimental designs; observational designs, such as cross-sectional and longitudinal studies; and large-scale survey research.
  - **Experimental designs**—proper, controlled experiments, with random assignment, controls, and treatments—allow you to be very precise about the connections between your variables. They let you do all kinds of things that other designs don't; you can control how variables are manipulated for your subjects, letting you really isolate the impact of variables that you think matter. The researcher has a lot of control over how the data is collected.

Experiments are widely used in the natural sciences and psychology, and the principles of experimental design can be applied to surveys and other kinds of studies.

Because of this, if you can answer your research question using a proper experiment, you probably should.

- But plenty of questions and projects do not lend themselves to experimenting, so you might need to pick another method, such as cross-sectional or longitudinal studies. With these **observational designs**, you can't control your subjects the same way you can with experiments. Instead of manipulating variables and seeing what happens, you have to simply observe the world as it is and figure out what you can about how it works. The typical approach is to take a large data set with information on a host of variables and conduct statistical analysis to look for correlation or causation.
    - **Cross-sectional studies** examine a set of cases at a single point in time, as if you were making a cut across space to look at a wide cross section of a population.

- **Longitudinal studies** look at a case over time. They let you study trends and changes over time by gathering multiple points of data about a case over a period of time. This can be particularly useful as variables change in value.
- You can combine both of these methods and do a design that is both cross sectional and longitudinal. In such a study, you would compare different units to each other over time.
- You can also do correlational studies that focus on looking for relationships between variables, often in existing data sets or ones that you build.

- **Large-scale survey research** is actually a type of cross-sectional design, but it is important enough in its own right to be discussed separately, as surveys are a commonly used tool in research. In survey research, you distribute questionnaires to large numbers of people to determine their characteristics, behaviors, attitudes, values, or beliefs. Rather than experimenting on people and observing the results, you are letting people self-report and then examining what they say. You might also compare groups across demographic indicators, which is why many surveys ask about respondents' age, gender, race, income, and education level.

QUALITATIVE APPROACHES TO RESEARCH

- **Qualitative approaches** generally focus on a smaller number of cases. Quantitative methods tend to sacrifice depth for breadth; you don't generally know a lot about any single case or subject, but the high variation in subjects generally gives you more room to draw conclusions about a wider population. Qualitative methods, on the other hand, allow for richer description and can be better at identifying causal mechanisms that help you understand why one variable might create change in another.

- Some of the principal qualitative methods are **case studies**, **field research**, and **action and evaluation research**.

    - **Case studies** are in-depth studies of one or a small number of cases—which might be individual or groups of people, organizations, countries, states, businesses, or events. The goal is to engage in extensive and in-depth description, interpretation, and/or explanation of the case or cases. The purpose may be to simply provide rich detail and description of a previously unknown case, to explore whether theoretical ideas apply to a specific example, or to trace the causal mechanisms connecting a set of variables.

    - **Field research** is a term that captures quite a few approaches. In general, it means to go out into the field—to leave your office or home and go to the place of the people or things that you are studying. You might simply observe the behavior of your subjects, or you might engage in participant observation, where you become a member of the community that you hope to study or interact with your subjects as you study them. Or you

might interview your subjects of interest—one on one in traditional interviews or in focus groups that might meet once or several times.

- Most of the methodologies so far focus on answering questions to satisfy your own curiosity, advance knowledge, solve puzzles, or learn things about wider groups, even if you only study a small subset of the group you are actually interested in.
  - **Action research** focuses on helping a specific group or community. It is frequently normative in its purpose, interested in resolving a problem rather than looking at wider patterns or puzzles for the sake of advancing knowledge. Instead, action research wants to use research to improve lives.
  - **Evaluation research**, used frequently in research on education as well as many other areas, aims at evaluating the effectiveness of programs, actions, or behaviors and their ability to solve the problem for which they were created. Typically, it involves establishing criteria for assessing the effectiveness of a program; then, the researchers analyze the program's achievement of those criteria as well as its strengths and weaknesses.

Before you can employ a particular research method or gather any data, you must determine your unit of analysis—that is, the unit (person, organization, government, country) about which you are gathering the data. It's basically an organizing element that can guide your data collection efforts.

Knowing your unit of analysis is vital before you start gathering data. Otherwise, you will gather data in a haphazard way, and you should strive to be as systematic as possible when it comes to research.

CHOOSING THE BEST RESEARCH DESIGN FOR YOUR PROJECT

- There are several key considerations to keep in mind when choosing a research design for your project.

  - **Consider your time and the resources available to you.** The ideal design might require you to conduct your own data collection, but perhaps similar data is already available for free or a small fee. Running your own survey or experiment takes a lot of time and resources, so you shouldn't feel compelled to do it for its own sake.

  - If the data doesn't exist, **consider whether or not there is a good reason why the data is missing**. In some cases, it may be that no one has worked on a project from the angle that you have or that the specific case or sample you want to study hasn't been tackled yet. But in some cases, the data you want might be very difficult or unethical to obtain.

> Since 1972, the General Social Survey has asked questions about various American behaviors and attitudes, from premarital sex to television habits. Rather than conduct your own survey on these topics, your time and money would be better spent using such existing, publicly available data.

  - **Consider your skill level.** You may lack the skill to do the specific study you want. Maybe it requires advanced data analysis or formal modeling or you would need to interview subjects in a language you do not speak. Either pick a research design that you are confident you can carry out or have a plan to compensate for those areas where you might need assistance, such as acquiring grants or collaborating with another researcher who can offer the necessary skills.

  - **Consider funding.** There is a lot of great research that can be done with no funding, but money certainly helps. And for some research, it is absolutely necessary. As you design your research, you will want to develop a budget that considers the costs at all stages of the project. The good news is that there are a number of organizations, such as universities, foundations, professional associations, and government bodies, that provide grants to fund research.

- **Consider the structure of your question and variables.** There is a reason why certain approaches are associated with certain disciplines, such as fieldwork with anthropology and experiments with the natural sciences and psychology. It is at least partly due to the fact that the kinds of questions those fields are interested in can best be answered using those methodologies.

The National Science Foundation approves approximately 11,000 proposals of the 50,000 submitted every year to support research.

- You should pay attention to the following kinds of factors as you decide which methodological approach to use.

    - **Consider whether or not you can control the administration of your treatment**—that is, whether you can assign which value on your independent variable a case falls into. Recall that the independent variable is the factor in an experiment that is varied to determine its effect on the dependent variable. You might have to work with what already exists, or you might be able to manipulate the administration of your treatment.

    - **Consider your control over alternative variables**—alternatives to the independent variable, or treatment you want to investigate. Are you able to isolate the factors that you think play a role in whatever outcome of interest you might have from those that you think don't matter? In an experiment, you can institute these controls yourself. You introduce a treatment to one randomly selected set of subjects but not others, making your variable of interest the one that varies. You can also eliminate other variables by ensuring they are the same for everyone. However, you don't need an experiment to control for other variables; sometimes you can select cases that provide some of these controls.

- **Consider the number of subjects or cases you either need or have access to.** If your project requires you to analyze a large number of cases, then you need to choose a method that can more readily produce that data. Experiments and surveys tend to produce data that lends itself to quantitative analysis, as does the building or use of large data sets used in correlational research. But if your question instead requires that you go more in depth on a single or small number of cases or subjects, then you are better off choosing fieldwork, focus groups, interviews, or archival work.

> If your work is focused on description, then the manipulation and control of variables aren't key considerations for you. An experiment would be unsuitable, but fieldwork or focus groups might be just right.

- Some of the best research takes a mixed method approach. This usually means a combination of methods—perhaps a quantitative study to look at the breadth of information on a set of subjects and then a qualitative study to investigate details or causal mechanisms of a few relevant cases. This combination of breadth and depth can be a very powerful way to get the answers to your research questions.

> Your ideal choice of research design for your project may be constrained by funding, skills, or other considerations. Such considerations may limit or expand your access to subjects, and the number of subjects you want or need will in part dictate your choice of design.

READINGS

Hay, ed., *Methods That Matter*.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 1.

Vanderstoep and Johnston, *Research Methods for Everyday Life*, ch. 4.

Walliman, *Social Research Methods*, ch. 3.

8

Measuring Concepts and Phenomena

You still have a few decisions to make before you can start designing your experiment, survey, or case study. First, you have to figure out how to measure the concepts or phenomena you plan to observe during your data collection—that is, how you are defining them and how you will know them when you see them.

MEASUREMENT

- Measurement is how you observe and catalog information about your concepts of interest and assign them numbers, symbols, definitions, and other meanings. Measurement is what takes you from vague and subjective feelings about a concept to something concrete and objective that invites comparison.

- How do you measure what you want to measure?

  - **Conceptually define your variable of interest.** A variable is a characteristic of a unit or concept that varies in value or category. Conceptualizing your variables requires

Coming up with good measures for abstract concepts can be very hard. Sometimes you just don't have good indicators for things you might want to observe, and many disciplines struggle with finding ways to measure concepts such as "success" or "effectiveness." There are no perfect answers. Look to the literature for ideas, and remember to defend your decisions and note that as a result your claims about your findings may be limited.

you to develop a clear definition of your concept. This is important because some concepts have multiple meanings, and you want to be transparent about exactly what you mean. Before you start looking for data, think through your definitions. One place to start is the dictionary. If your variable is a general term, such as "healthy" or "safety," it can be useful to understand how the term is used in general practice so you can refine your own thoughts. From there, you probably want to dive into the literature on your topic to see how scholars before you have defined the variable. This is useful for a few reasons. First, it can save you the time it would take to come up with your own definition, refine it, and defend it; if your definition is based on what other scholars have published, you can cite them. Second, you may find out that there is a conventional and widely accepted definition for your concept, in which case you can simply cite it and move on—so long as that definition fits your understanding and need for the concept. If there aren't already clear conceptual definitions for your topic, that's okay. Developing a new and compelling definition for a concept can be a scientific contribution in its own right.

- **Operationalize your variables.** This means determining what indicators you will look for to show you where your subject under study falls on that variable. It's simply the observable markers you look for to help you assess and categorize your subjects. As with many aspects of research design, this is not optional; you can't just skip this step and decide to figure it out later. Remember, your job is to be systematic, neutral, and replicable. If you don't start with clear rules on how to observe your concepts, you will be very likely biased toward finding the results you want and ignoring those you don't. Finally, keep in mind that you want to be transparent so that your work can be replicated. For that, you need clear procedures—including procedures on how you will measure and observe your variables. If your procedures aren't clear, there is no way for me to replicate your results.

HOW TO OPERATIONALIZE A VARIABLE

- **Figure out what the possible observable indicators are of your variable.** Using the definition that you created, consider how you would observe the incidence or absence of that variable in the real world. What kinds of behaviors or evidence would tell you about this characteristic of a subject? This process allows you to gather data about your subjects, who you could then categorize into groups by your variable of interest.
- **Determine how many categories you want within a given variable and what those categories should be.** The categories within the variable are often called values. Part of the operationalization process is determining what the theoretical range of values will be for your variables.
- One important thing to keep in mind when determining your values is how precise you want them to be. There are 4 main levels of measurement. In order from least precise to most precise, they are nominal, ordinal, interval, and ratio.
    - At the **nominal** level, you have a difference between at least 2 values within the variable. But you can't rank the values or order them in a meaningful way. A simple list of colors would be at the nominal level of measurement. The colors differ from each other, but one isn't "more color" than another. Other examples include marital status, race, ethnicity, nationality, and religious denomination.

- ▷ At the **ordinal** level, you still have the difference between categories, but you gain the ability to rank them in order. You can clearly define a highest and lowest, or tallest and shortest, or youngest and oldest and put all the values in order along that spectrum. You can't yet define distances between these categories, but you know who came in first and who came in last. This is more precise than nominal measures. An example would be your university year: freshman, sophomore, junior, or senior.

- ▷ At the **interval** level, you have the differences between categories from nominal measures and the ranking you get from ordinal measures, but you add the ability to define distances between categories. A variable at the interval level lets you clearly measure how far it is between one value and the next. Unlike nominal and ratio, it requires numbers. The classic example of an interval measure is temperature. You know that 70° is different from 40°—a difference between categories. You also can rank it against other values of temperature; for example, 70° is greater than 40° and less than 80°. But now you can say something more: 70° is 30° more than 40°. You can now clearly measure the distance between 2 values along the same variable.

- ▷ Ratio adds a subtle layer of precision to variables at the interval level. At the **ratio** level, you introduce to your variable a true zero and the idea of the absence of the characteristic. Zero is meaningful in a ratio measure; it indicates the absence of whatever it is that you are measuring, which enables you to talk about 2 subjects in ratio to each other. Consider the variable of income. The idea of a zero—$0 of income—is meaningful; it means the absence of income. Compare that to temperature, where 0° does not mean the absence of heat (even though it's pretty cold).

◇ There are many reasons to use one level of measurement instead of another. The higher the level of measurement, the more precise the data is and the more statistical tests you can run.

- Another advantage to using a higher level of measurement is that if you gather very precise data, you can always later recategorize that data to a lower level of measurement. But if you only gather your data at a lower level of precision, you can never jump back up to a higher level of precision during the analysis stage.
- Generally, it's better to get the more precise information first. At the same time, sometimes it is unnecessary or impractical to get more precise data. In the case of marital status, for example, the data doesn't make sense at higher levels of measurement. So, as with everything else, your project will determine how precise your measures need to be. When all else is equal, though, you should generally aim to collect the most precise data you can.

INDEXES

If you can't find a single high-quality operational definition, you have a few options.

- Simply note that you are keeping the scope of your study narrow and focusing only on this small group that you can readily observe.
- Use multiple operational definitions. This is common in research. Turning to multiple indicators lets you build a more robust set of criteria for your concept. One way to do this is to build an index, where you take responses to multiple items measured on the same scale and combine them to produce a single number that can represent the subject on that variable. Using multiple indicators and building indexes can also help improve both reliability and validity.

- Evaluate reliability and validity.

  - A **reliable** measure is a consistent measure. This means that the measure is going to give you a consistent result, no matter how many times you employ it or who administers it. This means 2 things: First, every time you employ the measure, assuming that your subject itself has not changed, you should get the same result each time. Second, consistency can be an issue when multiple people are involved in the data collection.

  - A **valid** measure is one that accurately and completely captures your concept. Validity has a higher threshold than reliability. A measure can be reliable without being valid, but it cannot be valid unless it is also reliable. There are many kinds of validity to consider, including face validity (on the face of things, is your measure a good indicator of your concept?) and content validity (which assesses whether your measure completely captures all aspects of your concept).

  - There are tests you can use to ensure that your measures are reliable and valid. For now, however, it's important to give a lot of consideration to the measures that you choose, making sure that they accurately capture your concepts and variables of interest and that they can be measured in a consistent way.

For a measure to be valid, it must also be reliable. But a measure can be reliable without being valid. In other words, reliability is necessary but not sufficient for validity.

One reason why you often want multiple indicators of your concepts is to maximize validity.

READINGS

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Vanderstoep and Johnston, *Research Methods for Everyday Life*, ch. 3.

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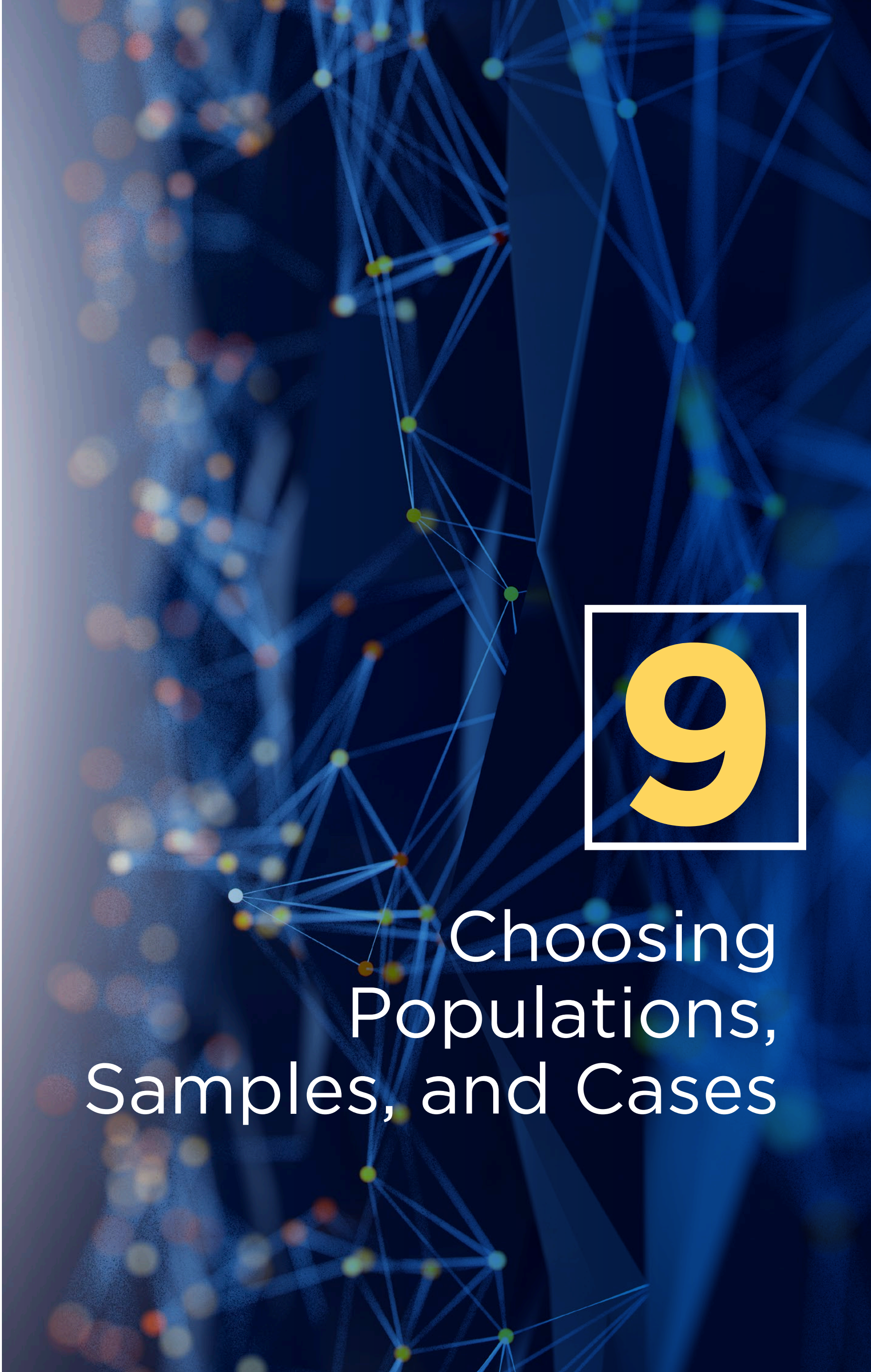


9

Choosing Populations, Samples, and Cases

When you're undertaking a research project, it's essential to determine the entire group of cases to which your research applies and what subset of that population, or sample, you are actually going to study.

SAMPLES, POPULATIONS, AND CASES

- For researchers, the **population** is the universe of cases to which the research applies. The universe of cases includes every possible unit that meets a certain set of criteria that you define. When researchers analyze presidential approval ratings, for example, the population of interest is usually all American adults. Once you know your research project, you have to determine the set of cases that meet your criteria. This might be people, animals, organizations, governments—it depends on your discipline and your project. The population contains every instance of these that meet the criteria you establish.

- A **sample** is any subset of this population. It is a slice of the population, and there are usually rules about how that slice is chosen. Researchers often work with samples rather than populations. If you are studying presidential approval ratings, your sample would be some portion of the 250 million or so adult Americans—maybe just 1000 of them. Any time you are limiting your actual data collection to a subset of cases within a population, you are using a sample.

Samples, populations, and cases are all essential building blocks of research and data collection.

- A **case** is essentially a single unit of what a researcher is studying. A case would be a single individual adult American asked about whether he or she approves of the job the president is doing. The researcher will probably make several observations about that single unit, such as demographic information and political party affiliation.

There are many reasons researchers study a sample rather than the population.

- Research is time consuming and expensive. It can also be impractical to survey every person in a population—for example, all American adults.
- Consider your skill set as a researcher. If you wanted to interview people about their social media habits in different countries, either you would have to be fluent enough in dozens of languages to conduct the interview yourself or you'd have to hire people to do the interviews for you.
- Research is cumulative. You might only study a small sample in your project, but combined with other projects that study other samples, collectively you might be able to say something about the population. So, you don't need to study the entire population yourself to have something to say that is of value.
- Sometimes the population is so large that you can't actually study it. In this age of big data, data sets can be so large that statistical models can't accommodate them, so you have to sample to make the data more manageable for analysis.
- It may not be possible to study the population. The data may not be available or the population might be unknown or difficult to access.

Although there are many reasons why studying the entire population is difficult, the good news is that you don't actually need to study the population.

- When you use a random sample, you can estimate how well your sample actually represents the population and you can report how confident you are in those results.
- Even with a nonrandom sample, you can discuss the extent to which you can say things about your population after only studying a sample.

Samples allow you to take on a manageable project while still answering valuable research questions.

SAMPLING PROBLEMS

- There are many ways to sample, and some are better than others, so you need to make sure you are sampling in a way that makes sense for your project and that follows sound practice. For example, many inferential statistics that you might want to use to analyze your data rest on certain assumptions about how the sample was drawn. If you don't use a random sample, those assumptions will be broken and the test will not be very useful. Other tests might require the entire population to be included in order to be used. So, you might want to consider your plans to use quantitative analysis before choosing how to sample.

- Two of the most important issues with samples, though, are the problems of generalizability and sampling error.

- Generalizability refers to the extent to which the results from analyzing a sample can be said to apply to the entire population. If you have a large enough sample drawn randomly from the population, you can at least estimate how confident you are that the sample accurately reflects the population. If you don't use a random sample, however, you are more limited in how much you can generalize from your sample results to the population.

You can't use your own personal experience or the experiences of people around you to make claims about larger groups. You (or they) are not necessarily a good sample of that wider population, and you (or they) weren't chosen in a systematic way.

- Sampling error is the difference between a sample statistic (such as a mean) and a true value of the population. It's actually highly connected to the issue of representativeness. Anytime you are using a sample, you need to recognize that the single sample you are studying is not the only possible sample you could have studied. The results of your study will be somewhat different depending on which sample you use, yet you are only going to use one. This is why sampling error can be a problem: You may claim things to be true of the population when, in fact, the value for the population is different than that of the sample you ended up studying. This can limit your ability to generalize your results for your sample to your population.

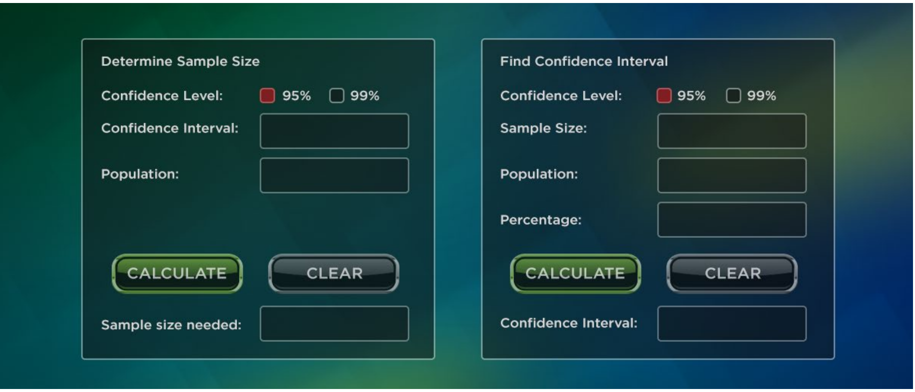
> Samples are very useful, and commonly used, but they have drawbacks.

SAMPLE SIZE

- Qualitative research is sometimes referred to as small-*n* research, where *n* is the number of cases in a study. Qualitative research usually focuses on a small number of cases, while quantitative research, or large-*n* research, focuses on a large number of cases. Small-*n* research can focus on as few cases as 1; that is called a single case study. More typically, you might study 2, 4, or up to maybe 20 cases in depth. You aren't usually conducting statistical tests in small-*n* research, so the number of cases is really only restricted by your time and the number of variables you are studying. The more variables you study, the more cases you need.

- When it comes to quantitative data, a larger sample is generally better, so long as it is chosen in a systematic way that minimizes sampling error. The closer you get in size to the population, after all, the more accurate your results will be. But given that gathering observations costs money and time, you want to know how many observations are enough. Luckily, there are ways of calculating the necessary sample size. For example, calculating sample sizes for large surveys can be done with just 3 pieces of information: the size of the population, the margin of error, and the confidence level.

  - **Size of the population.** How many possible cases are there from which you can draw your sample? You need to have at least a rough sense of this to draw an accurate sample.



  - **Margin of error.** How much error are you willing to live with? How far off from the true value of the population are you willing to be? The lower this is, the bigger the sample you'll need. Typical margins of error are 3% or 5%.

  - **Confidence level.** How confident do you want to be that your sample statistic is the same as the population's true value? This is usually 95%, which means you are willing to accept a 5% chance that your results are wrong, but levels at 90% or 99% are also used. As with margin of error, the higher this is, the bigger the sample you'll need.

- There are free websites that will calculate the sample size for you once you have this information. Use them.

- One common rule of thumb for quantitative analysis is to ensure that you have 10 cases for every variable in your study. So, if you have 10 variables, you would want at least 100 cases in your sample.

SAMPLING METHODS

- How do you determine the exact cases that make it into your sample from the population? There are 2 broad categories of sampling: probability samples and non-probability samples.

- A **probability sample** is one where each unit in the population has a known chance of being included in the sample. When each unit's chance of being in the sample is equal to every other unit's chance, this is called a random sample. You might take a simple random sample, where all the units are in one big group, and use a random number generator or table to pick individual units until you reach the desired sample size. Or you might take a stratified sample, where you divide the population into strata, or groups, based on a characteristic of interest, and then randomly sample from each group to determine which specific units go into the sample.

  - To draw a random sample, you first need a **sampling frame**—some kind of observable list or construction of the members or units of your population. You need to compile this list with care; obviously, if a unit gets left off the list, it has a 0% chance of being included in the sample, and the sample is therefore no longer completely random. One of the many issues with samples and populations is that sometimes it's impossible to generate a complete population list, so other techniques must be used to generate a strong sample.

  - In **cluster sampling**, you divide your population into clusters and then randomly sample which clusters to use in your study. You might then sample again from within each of the selected clusters.

  - Once you've used your sampling frame to create your population list, the next step is to decide your sample size. Then, you have a few options to determine which cases from the list end up in the sample. You can use computer software to randomly select that number of cases from your list. Or you can label each case with a number

Once a case is in your sample, it stays there. You can't throw it out because you would have preferred another case to be in there. That opens up the sample to bias.

and use a random number generator or table to pick cases. Or you can conduct a **systematic sample**, where you pick every 10th or 15th or 100th case to go into the sample.

- Random samples aren't always the appropriate choice. In some kinds of studies, you know the specific people or groups you want to study—maybe due to a particular skill set or variable of interest. In such cases, researchers turn to **non-probability samples**, in which the chance of any one unit being included is not only not equal to that of other units, but isn't known at all. The following are examples of non-probability sampling.

  - **Convenience sampling** is where you stop people on the street and asked them to participate in a survey—and whoever stops gets interviewed. Those who choose to stop are in the sample, and those who don't are not. Although this is common, it is not a good way to sample, because the participants are self-selecting.

  - **Quota sampling** is a different kind of nonrandom sample. Like stratified samples, in a quota sample, you determine categories of interest and then accept cases into the sample until you fill that category—until you meet the quota. This is still a type of convenience sampling, though, and faces the same concerns. You'd probably be better off in most cases going with a stratified random sample.

  - **Purposive sampling** is more commonly used, especially in small-*n*, or qualitative, research. This is where the researcher chooses a sample with purpose, aiming at acquiring one that achieves certain characteristics. Depending on your project, that might give you more interesting results than selecting a random sample.

    - **Snowball sampling** is another sampling method. It is most commonly used to find interview subjects, especially if the group you want to interview is hard to find or mistrustful of researchers. In this method, you identify a small number of relevant people to include in your sample, interview them, and then ask them to give you some more names or introduce you to other relevant people. You do this until you get the sample size you want.

- There are other ways to sample, but this covers the basics. The goal is to minimize bias in the sample so you can generalize your results to the population—the wider group you are actually interested in explaining.

Identifying populations and selecting samples is tough, and depending on your project, you might not be able to do a perfect random sample. That's okay. Most researchers have to wrestle with incomplete data and imperfect methods. But you need to be open and honest—transparent—about the decisions you made and able to justify your choices.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, ch. 5.

Walliman, *Social Research Methods*, ch. 9.

10

The Classic Experiment

An experiment is a method where a researcher manipulates one or more variables and then observes the effect of those manipulations on the experiment's subjects. The classic, or true, experiment is the hallmark of research in the natural sciences, medicine, psychology, and many other disciplines.

FEATURES OF TRUE EXPERIMENTS

- Not every research question can be answered through an experiment, but if all else is equal, you are generally going to get better—that is, more reliable and valid—results using an experimental design than other research methods.

- The reason is that an experiment maximizes the control that you, the researcher, have over your subjects and variables. In an experiment, you control your variables and how they are measured. You don't have to rely on a business or government for keeping accurate records. You don't have to restrict yourself to how things have already played out in the real world. Instead, you are the puppeteer pulling the strings and can directly witness—and record—the impact of your manipulations.

- There are 4 features of a true experiment. The first 2 apply to pretty much all experiments; the second 2 are key when you are experimenting on people.

  - **Control.** More than anything else, control defines an experiment. Control means you can prevent outside factors from interfering in the outcome of your study. You do this by using very systematic, set procedures that are followed rigorously to ensure that the study conditions are the same throughout and by using a control group in addition to a treatment group. A control group refers to whatever subset of subjects do not receive the treatment or intervention. A treatment group, in contrast, is the subset of subjects that do receive that treatment or intervention—that's the group you will manipulate in some way to see how your variable of interest affects them. Having a control group is extremely useful. Without it, you don't know if any change observed in the treatment group occurred due to your manipulation or some other factor.

> Whenever you are experimenting with people, you have to watch for reactivity—the problem that arises when humans know they are being studied and therefore change their behavior, perhaps without realizing it.
>
> This is why medical research uses placebos. When people take a drug, they are likely to report a change in their symptoms even if the drug doesn't do anything. The control group takes a sugar pill, or placebo, so that the researchers can document this placebo effect and ensure that any change seen in the subjects receiving the actual treatment is, in fact, due to that treatment.

- **Manipulation.** This means that the researcher has the ability to manipulate the independent variable by administering a treatment. By introducing a treatment, you, as the researcher, are changing the environment of your subjects and are able to observe what impact that change has.

- **Random selection of participants.** If the goal of your research is to say something about a wider population and you can only observe a small subset of that population, then generally you would like the subset to represent that wider population. The best way to do that is to use a random sample. Having a random sample helps increase the external validity of your study—the chances that the results of your study can apply to the wider population, not just those in the study itself. But it is actually quite common in experiments to not use random samples, simply due to the nature of the study or the difficulty of recruiting a pool of random subjects. In practical terms, this particular requirement is often overlooked and viewed as ideal but not necessary.

Many experiments rely on nonrandom samples, simply due to the difficulty of finding participants. These experiments suffer from external validity issues, but that's why replication is very important—so that it can be determined whether an experiment completed on one set of participants holds up when conducted on another set of participants.

- **Random assignment of subjects to groups.** Random assignment means that your participants do not get to choose which group they are placed in. They are randomly placed, by the research team, in the treatment group or the control group, with an equal chance of ending up in either group. If you don't use random assignment, then you can end up with selection bias problems.

In a true experiment, random selection combined with random assignment helps ensure that any differences between the 2 groups is due to chance. This minimizes the ability of other variables to play a role in any change you observe in your dependent variable. If you see change, you can claim with some confidence that the change is likely due to your independent variable. That gives your study greater validity.

VALIDITY

- Validity is essential to your understanding of measurement. Validity means that any measure of a variable needs to be a valid, or a true representation of your concept. To be valid, a measure must also be reliable, or give consistent results. You can also use validity in a broader sense than just measurement. You can discuss the validity of your study as a whole and the extent to which it has value.

- There are 2 types of validity: internal validity and external validity.

  - **Internal validity** is the extent to which you can attribute any results to the independent variables and not to something else external to the study. If you claim that your study has internal validity, then you are saying that you can be reasonably confident that within the study itself—internal to it—you are truly testing the role of the independent variable in affecting your dependent variables. You are, to the greatest extent possible, eliminating outside factors.

In the 1920s, a series of studies were done at Hawthorne Works in Chicago. The managers at Hawthorne wanted to see if changing the level of lighting in their building could increase the productivity of their workers.

There was actually no difference in productivity at levels of low or high light. Instead, productivity increased whenever the lights shifted in intensity—regardless of whether the actual level of the lights were low or high.

The researchers concluded that the workers knew that whenever the lights changed, they were being observed, and this caused them to increase their productivity. This became known as the Hawthorne effect in research.

- Random assignment to groups is one of the ways that experiments help increase internal validity. Using blind studies or deception can also help. You want to design your experiments to reduce threats of internal validity as much as possible.

- Unfortunately, there are many things that can threaten the internal validity of an experiment—not all of which can be prevented, either. You can design your study to minimize their impacts, but when they do happen, you have to catalogue them and then later assess the potential impact they have on your study. The key is transparency.

- The following are some threats to internal validity.

  - **Reactivity effects.** This means that people change their behavior when they know they are being watched. When people agree to participate in your study, they don't become a blank slate. They are still people, and they know that you are looking for something—some kind of behavior, or reaction, or change. Some subjects may try to give you what they think you want to be helpful; others might deliberately refuse to help you or even try to sabotage you. It's not your treatment that changed them—it's wanting to either please you or buck the system. To guard against the reactivity problem, design your experiment in such a way that your subjects don't know what kinds of behaviors you are looking for and set up your observation systems so that they are as least intrusive as possible.

  - **Testing effects.** Sometimes you want to measure your dependent variable multiple times during your study. That might entail having your subjects take an exam, fill out a survey, or engage in some kind of activity. For the sake of simplicity, these can be referred to as tests. It is possible that simply by taking the same test more than once, subjects improve their scores—not because of any intervention or treatment, but simply from being more familiar with the test.

- **History effects.** These are outside events that occur during a study that may affect subjects. Remember that your goal in an experiment is to control as much as you possibly can. That means you want to ensure that the only thing changing for the subjects in your treatment group are the variables you want to manipulate. But if you are doing a study that takes place over time, history effects can threaten the validity of your study.

- **Maturation.** Subjects quite simply change over time. If your experiment runs for a lengthy period of time, your subjects' beliefs, attitudes, and behaviors may change simply due to the passing of time. This is particularly true when you are studying children or people over the course of their lives.

- **Mortality.** Subjects drop out of studies. For the purposes of your research, these subjects are "dead," as you can gather no more data on them. There may be something systematic about the people who drop out that could impact or invalidate your results.

- **Diffusion effects.** These occur frequently in educational settings. Diffusion occurs when the treatment meant only for the treatment group ends up being applied to the control group as well. In other words, the treatment gets diffused into the control group.

◇ There are many other possible threats to internal validity, but these are some of the big ones that you need to watch out for.

- **External validity** refers to the extent to which you can generalize the results you get from the sample you study in your experiment to a wider population. This is usually your goal. Typically, you aren't interested in learning only about the small group of people or other units you actually observe and analyze in your sample; you select the sample from a larger population and then hope that by studying the results of that sample you can say something about the larger population. The key to ensuring external validity is to make sure that the sample itself represents the population. This is best done in an experiment by using random selection of subjects from the population. That is one reason why random selection is one of the requirements of a true experiment. Also, minimizing some of the same threats to internal validity can help preserve external validity.

> A study can be said to have external validity when you are reasonably confident that you can extrapolate from your study's results to that population you ultimately care about.

- Understanding validity is essential to producing strong research. When designing an experiment, you need to be hyperaware of threats to validity and do your best to minimize them. In general, experiments can be really strong at internal validity, but because they frequently are done in laboratories and other controlled conditions, they may be less representative of the real world. Therefore, experiments can sometimes suffer from problems of external validity. This is one reason why experiments tend to be replicated: If repeating the study with new participants or environments shows similar results, it can provide support for the external validity of the study.

DESIGNS FOR TRUE EXPERIMENTS

- Three of the more common designs for a true experiment are the posttest-only design, the 2-group pretest-posttest design, and the Solomon 4-group design.

  - In a **posttest only-design**, you only measure the dependent variable once: at the end of the study, after the treatment is administered. That's called a posttest; you measure the dependent variable after, or post, the treatment. You would compare the results from the control and treatment groups to see if there are any differences. But how do you know that whatever change you might see between the 2 groups at the end wasn't already there before you started? Even though you may have used random selection and assignment, it's possible that random chance resulted in some systematic differences between the members of the 2 groups—and your treatment had no effect.

- The **2-group pretest-posttest design** is exactly the same as the posttest-only design, except you also use a pretest. You measure the dependent variable at the beginning of the study, before any treatment is administered—that's the pretest—and then again at the end, in your posttest. You do this for both your treatment group and your control group. But sometimes pretesting just isn't possible or isn't necessary for the study. This is one reason why the posttest-only design is still in wide use. But there are several advantages to using a pretest, and the 2-group pretest-posttest design is fairly common in research. But while it has higher internal validity than the posttest-only design, it still suffers from a problem: Taking a pretest by itself can change the behavior of your subjects. Testing effects can lower the internal validity of your study, and using a pretest increases the risk of testing effects.

Advantages to using pretests include the following:

- You can compare the pretests to make sure that your 2 randomly assigned groups are indeed relatively equal. If they aren't, you can account for those differences in your analysis.
- Pretests let you see whether or not the treatment had an actual impact by letting you compare subject scores on the dependent variable before and after your intervention.
- You still get to compare the posttest scores of the treatment and control groups, as you can in the posttest-only design.

- The **Solomon 4-group design** has all the features of the pretest-posttest design but consists of 4 groups, not 2. You still have random selection and assignment—that doesn't change in a true experiment with human subjects—but now you have 2 control groups and 2 treatment groups, and in each set, only 1 group gets a pretest. This is much more expensive and difficult to do than a pretest-posttest design. The extra 2 groups mean you need many more subjects. You also need to be able to coordinate the administration of the treatment (and, if necessary, a placebo) to 2 different groups at the same time. And the results can be much more complicated to analyze. But there are some clear advantages. The Solomon 4-group design maximizes control. It lets you check to see if testing or reactivity effects are present, for example.

- There are other designs for true experiments—for example, in some cases, you won't be able to have 2 groups, or you might have multiple treatments, in which case you'll have several treatment groups—but these 3 designs will give you a good starting basis on how to structure your true experiment.

READINGS

Barker and Milivojevich, *Quality by Experimental Design*.

Elliot, *A Class Divided*.

Vanderstoep and Johnston, *Research Methods for Everyday Life*, ch. 5.

11

The Value of Quasi Experiments

A quasi experiment meets some but not all of the requirements of a true experiment. While the results of quasi experiments do not carry the full weight of a rigorous scientific finding, that doesn't mean that they are worthless or that the findings are without merit. But such findings should be interpreted with caution.

TRUE EXPERIMENTS VERSUS QUASI EXPERIMENTS

- True experiments are the hallmark of scientific research. But quite often researchers simply can't do a true experiment. Consider the criteria for a true experiment: control, manipulation, random selection, and random assignment.

  - **Control** may not be possible or desirable. You might be in the early stages of a research project and testing a particular treatment. In such cases, putting half your subjects into a control group might not be a good use of resources.

  - You, as the researcher, may not be able to **manipulate** the variables you need; they may occur naturally in a population you wish to study.

  - Limited access to subjects or high costs might prevent true **random selection**. In fact, very few experiments end up using random selection of subjects. One reason might be because the nature of the study demands nonrandom participants, such as in a medical study where you may only want participants currently suffering from a particular ailment. Another is pure practicality; recruitment is difficult and you work with whomever you can get.

  - **Random assignment** can be difficult. There are times when your subjects of interest sort themselves into groups—and not always randomly. You might be interested in studying economic policies, for example, and you can't randomly assign some countries and not others to practice austerity.

- In these situations, researchers often turn to quasi-experimental designs. And if you find yourself needing to do that, don't despair. Such alternate kinds of research can have tremendous value in answering questions, solving problems, and increasing knowledge of the world.

- True experiments let you claim causality because you, as the researcher, control and manipulate the independent variables. When combined with random selection and assignment, this lets you be pretty sure about the role of your independent variable in leading to change in your dependent variable. You can establish cause and effect.

- In a quasi experiment, some of these things remain the same. You still have subjects, groups, treatments, and measures of a dependent variable. What you typically don't have is random assignment to groups or complete control over all other possible variables. Differences that arise between your groups, therefore, may be due to factors other than your chosen independent variable. That means that even if you find differences between your treatment and control groups, you can't be confident that they are caused by your independent variable.

- There are other differences. Quasi experiments may occur outside of a controlled laboratory environment. That is one reason why the researcher can't control for other variables. And typically people are already assigned to groups outside of the control of the researcher. For example, in a study comparing children with different birth orders, you can't randomly assign a subject to suddenly be the first-born child.

TYPES OF QUASI-EXPERIMENTAL DESIGNS

- When conducting an experiment, aim for as many of the elements of a true experiment as possible so you maximize the validity of your work. But if you want to work on a project where some of those criteria just can't be met, you still have a number of quality options available to you.

- In the **single-group pretest-posttest design**, there is no control group. You measure the dependent variable, introduce the treatment, and then measure it again. But this goes against a key idea of an experiment: Experiments are all about control. But there are reasons to sacrifice control.

- Single-group pretest-posttest designs are often used as preexperiments, or pilot studies. It's a way of testing your ideas on the cheap before committing to a full-fledged experiment. When you are using treatment and control groups, you are really looking for 2 effects: You want to see that the treatment matters for the treatment group—that is, if the dependent variable changes after the introduction of the independent variable—and you want to see if the control group shows no change. If the control group changes, too, then you can't really say that your independent variable is what caused the change. This is why control is usually so important.

- But if the treatment group shows no change, you don't need the control group. That alone tells you that your treatment doesn't matter. The control group's role is to help you eliminate other variables—not to establish the viability of the independent variable.

True experiments are valued because they maximize the internal and external validity of the study, but plenty of studies that are unable to attain that high bar still help answer questions and improve knowledge.

Your goal is to aim for the 4 criteria of a true experiment when possible, but when it isn't, do the best you can to still achieve the goals of internal and external validity—and acknowledge where you fell short. Think of this as more of a continuum than a dichotomy: You are aiming for the ideal, but falling short of that is not a deal breaker.

- That's why running a preexperiment pilot can be so valuable. It tests to see if the treatment matters. If it doesn't, then you end the study without committing to the greater expense of adding a control group. Remember, that's a lot of participants to recruit, each of whom might need to be paid for their participation. If you do find results in the pilot, that can justify the further expense to grant agencies to do a more thorough study.

- Let's say you have an idea for a new training program in your company, perhaps on methods to increase work productivity. You've discovered a new task management system that works really well for you, and you are curious if it would help others in the office as well. You know that your personal experience alone may not be representative, so you want to do a pilot study before suggesting widespread adoption of this new software.

- You could build a true experiment to achieve this. You could get a random sample of employees and randomly assign them to one of 2 groups: one group receives the treatment, which is training in how to use this new task management software and committing to use it for 2 weeks, for example; and the other group gets no training. Both groups take questionnaires at the start and end of the experiment to self-assess their productivity.

- But is all of that really necessary at this point? You just want to know if your new task management system that you like so much might help others in your office. Why not go with a 1-group pretest-posttest design? Recruit some coworkers, have them fill out the questionnaire to self-assess their current productivity, train them in the use of the software, and then test again after the 2-week period is up. If you see strong results, you could then do a second run with a control group to check for the influence of other variables.

- It might be, for example, that simply being asked to focus on productivity makes people more productive—or that a Hawthorne reactivity effect is occurring. But it's also pretty

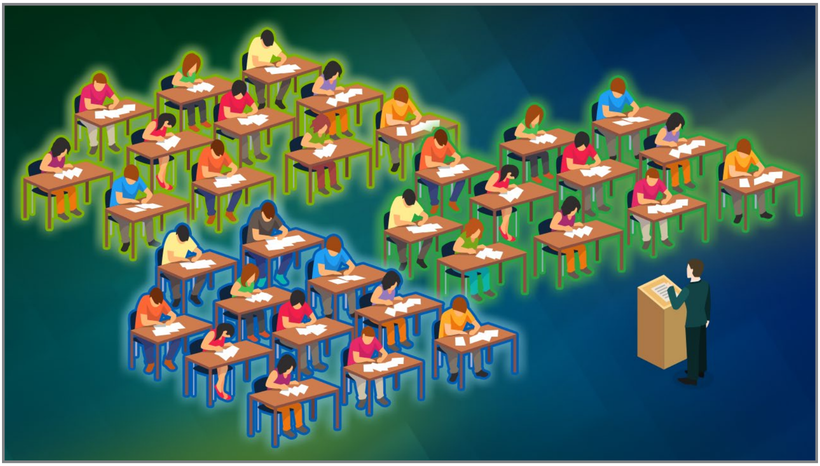
Often with experiments, researchers end up recruiting those who are willing from those close to hand. Many academics use their university's students for their studies, precisely because they are convenient and usually cheaply acquired—sometimes just for extra credit.

You shouldn't fault an experiment too much for using a convenient population; you just have to limit your expectations of the external validity of the study and possibly replicate the work.

common for a pilot study like this to forego the full study with the control group and just use the results to assess whether or not employees should be trained in the use of this software. Just be honest about the limits of the preexperiment and note that the results may differ when other groups undergo the training.

- Another type of quasi experiment, called the **nonequivalent groups design**, mimics the true experiment in all but one way. You have 2 groups, 1 treatment, and 1 control. You measure the dependent variable for both groups, introduce an intervention to the treatment group, and then measure again for the 2 groups. The only difference—and it is an important one—is that the assignment to the control and treatment groups is nonrandom. Instead, you end up using preexisting groups that are similar, such as 2 organizations or communities of the same size or that consist of the same people.

- Let's say that you want to study the impact of participating in a simulation on student learning. You are interested in whether participating in the simulation is enough by itself, if it needs to be combined with a lecture for maximum impact, or if lecture alone is best. You give your 3 sections a quiz on the material and then lecture to 2 sections of a class but not the third. One of the lecture-only sections does not participate in the simulation, but the other 2 do. All 3 sections then take a second quiz on the material.



- This is a quasi-experimental design. It's taking place in a real-world setting: a classroom. Assignment to each group is not random, and there might be systematic differences between the groups. There are also some concerns about internal validity—testing effects, history effects, and Hawthorne effects, for example—that might interfere with your results. Yet none of this would negate the potential impact of such a study. The key is to recognize these potential limitations, try to minimize them where possible, and ultimately report them when you write up your results.

Quasi-experimental designs fall short of the ideal criteria of a true experiment, which means that you are not able to draw as many conclusions from quasi-experimental approaches. This is because they lack the highest levels of internal and external validity.

- Another kind of design is **repeated measures designs**, in which you take measures of the dependent variable at multiple times across the experiment, looking at the impact of the independent variable over time. For example, if you are studying weight loss, you would take multiple measures of weight, perhaps once a week, while in the intervening periods you are introducing your independent variable—maybe dietary restrictions or an exercise program. This allows you to look at effects over time.

- **Interrupted time series designs** are a version of this where you typically measure the dependent variable at least 3 times before treatment and 3 times after treatment. This can help reduce the role of maturation effects on your study because you are documenting changes in your subjects both before and after the treatment.

- There are also **single-subject experiments**, in which you start off with a control or baseline condition in a single case, then introduce a treatment, and then return to the control condition. This lets you test to see if the treatment matters. This kind of design is something you might use in your daily life. You might, for example, go from not drinking coffee to drinking a cup a day to not drinking it again to see the impact the caffeine has on your system.

There are many other quasi-experimental designs, but these are some of the most relevant ones that you can use as a basis for designing a true or quasi experiment for your own research project.

READINGS

Darley and Batson, "From Jerusalem to Jericho."

Vanderstoep and Johnston, *Research Methods for Everyday Life*, ch. 6.

12

Designing and Conducting a Survey

Surveys are questionnaires designed to gain feedback from multiple respondents on a given set of topics. The goal of survey research is to identify characteristics of a given population—people's attitudes, beliefs, goals, behaviors, preferences, opinions—by asking them questions.

TYPES OF SURVEYS

- Surveys can be incredibly varied in length, approach, distribution method, and types of questions.
  - When surveys are aimed at a smaller number of people or allow the interviewer to significantly adapt his or her questions in response to what the respondent says, they are referred to as **interviews**.
  - When the researcher asks small groups to meet and offer their answers, responding to each other as well as to the interviewer, these are called **focus groups**.
- Classic survey research, however, focuses on interviewers following a set list of questions in a structured questionnaire to a lot of people, allowing researchers to compare data across a large sample of the population. They tend to produce more quantitative data compared to interviews and focus groups.
- Surveys are one of the easiest data gathering techniques to use. If you have a computer, or even just a notepad and a pencil, you can make a survey. You can use them for your own individual project, a team project at work, or a volunteer organization or religious group. You can do a single survey of people to get a snapshot of their perspective at one point in time or repeat the survey at regular intervals to see changes over time. You can even do an experiment within a survey by giving different questions, wording, or prompts to a sample of your respondents.

National Geographic and Gallup teamed up to find the happiest places on the planet. They conducted more than 250,000 interviews with people about a variety of things, including 3 different measures of how happy they were: overall life satisfaction, day-to-day happiness, and finding meaning and purpose in their lives. Their research found Denmark, Costa Rica, and Singapore to be the happiest countries. This research also found the happiest cities in the United States to be Boulder, Colorado; Santa Cruz, California; and Charlottesville, Virginia.

- You have many choices in how to administer surveys. They can be done in person or by direct mail, phone, email, or the internet. Some of these have higher response rates than others. Getting high response rates is difficult in surveys in general, so be prepared for that.

- **In-person interviews** tend to have some of the highest response rates, partially because it's easier for the interviewer to build rapport with the respondent.
- **Phone interviews** with a live interviewer have less of that connection and, due to call screening, lead to a lot of survey requests being ignored.
- **Direct mail** and **internet surveys** allow for greater anonymity for the respondent, as respondents are less likely to worry about giving an answer an interviewer might not want to hear. They are also very convenient for the respondent—but can frequently be ignored or forgotten about.

- Sending introductory messages and reminders or providing a financial or other incentive are all ways you can increase your response rate, regardless of which method you use—although more and more people's concerns about privacy are inhibiting response rates and quality, regardless of the mode of distribution that you use.

- Another factor besides your method of administration is cost. Conducting a survey can entail large costs in terms of both time and money. You have to design the questionnaire, determine the population, draw a sample, send requests and follow-ups, and possibly train other interviewers to administer the survey. Then there are the monetary costs of printing surveys, paying interviewers, postage, or phone fees. A massive in-person national study will cost the most, while internet surveys cost much less.

- In addition to being low in cost, one benefit of doing surveys via the internet or email is that you can use open-source survey software. You can write questions using a variety of options, including open-ended questions, multiple-choice questions, and questions allowing you to rank a set of options. Most survey software includes intuitive question templates so that you can easily ask exactly what you want to know.

- Survey software also lets you use branching and skip logics, which allow you to direct respondents to a specific set of questions based on what they have already answered.
  - Using **skip logics** in the software, you can indicate that any respondent who answers a particular question—such as "how often do you go to the zoo?"—with a response of "never" automatically skips past the questions about zoo behavior. The respondent never knows there were questions about zoo behavior and is less likely to stop filling out your survey because the questions don't seem to apply to him or her.
  - Alternatively, you might want to know why the respondent has never been to the zoo. In that case, you might use **branching logics**, which route respondents to different parts of the survey based on their answer. Instead of skipping ahead, respondents are taken to another part of the survey that asks questions about why he or she has never been to the zoo. Using branching logics, you can ask different questions of different respondents without making the survey experience of any one person too long or cumbersome.
- You can do all of this without using software, but it does make it easier. And because there is user-friendly software available for free at the basic level, the monetary cost is usually quite low. You can distribute your survey via an email or by setting up a link and therefore don't have to face the costs of copying, printing, and mailing or hiring phone or in-person interviewers.

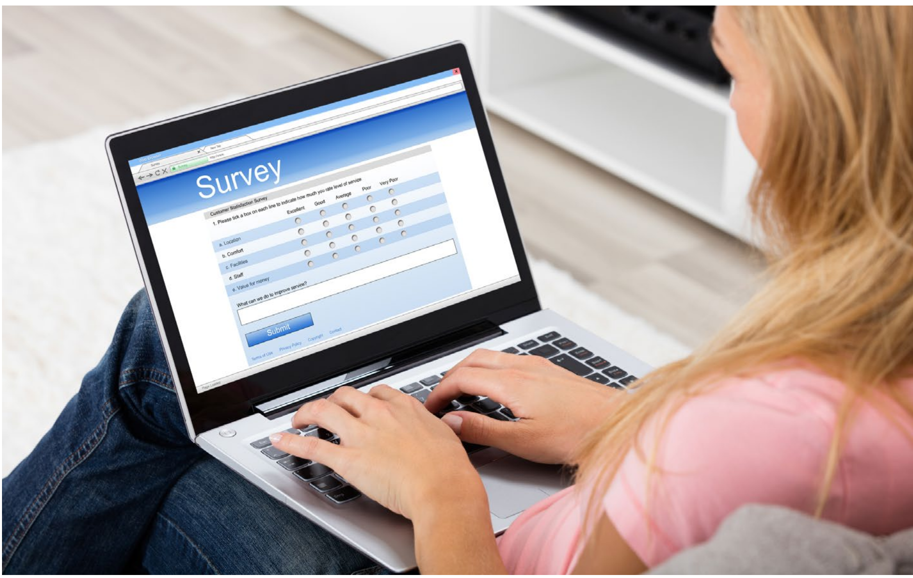
The least expensive option for conducting a survey is to use existing archived survey data, such as the General Social Survey, a national survey on American "attitudes, behaviors, and attributes" conducted since 1972.

Don't put in the work of creating your own survey if the data you need already exists and is publicly available. The literature review should tell you what already exists on your topic.

WRITING SURVEY QUESTIONS

- Once you've decided that your project is suited to a survey and you've settled on how you want to administer it, the next step is writing the survey.

- First, consider how many questions should be on your survey. The fewer questions there are, the more people will be willing to respond, which increases your response rate. But this also means that you gather less data from each respondent. More questions lead to a richer data set, but people might not be as willing to participate in the first place or may quit halfway through. To guard against this, only ask as many questions as you absolutely need; in some cases, a single question might be enough. If you do plan to use a survey that will take a respondent's time, perhaps 10 to 15 minutes or longer, consider offering an incentive. This depends on your available resources, of course, but even offering a gift card to a lucky respondent can be enough to encourage people to participate.



- Next, you might want to include some questions that ensure the respondent is eligible for participating in your study. If you are sampling in such a way that specific individuals were selected for the sample, then you need to make sure that the person responding is that individual.

- Most of your questions are going to center on getting the necessary information on your independent and dependent variables, just as with any data gathering. But you may also want to get information on alternative and control variables as well as information about your respondents. Many surveys, therefore, will include questions about demographics, such as sex, gender, age, income, race, ethnicity, sexual orientation, education, religion, country or state of residency, marital status, occupation, employment status, and nationality. These demographic questions can be very useful to compare subgroups within your respondents—so you can compare men to women or younger people to older people.

- You won't necessarily ask all of these demographic questions; only ask the ones that make sense for your study and that will give you useful data. Remember that demographic questions can bring up sensitive issues, and if they are poorly worded or seem completely irrelevant, they might lead a respondent to quit your survey. This is why you typically put demographic questions at the end of a survey and why you include options to let people not answer them.

- How do you actually write survey questions in a way that will give you the results you need? The following are some tips for writing good survey questions.

  - **Use plain, neutral, and objective language.** You need to make sure that respondents clearly understand what you are asking so they can give you accurate responses. This means that your language must be plain, easy to understand, neutrally worded, and objective. In some cases, you may have to have your survey translated or include an interpreter in your planning. Don't use technical language or jargon that your respondents won't be able to follow; if you have to use jargon, make sure you provide a clear definition. Using objective language means that you shouldn't use any judgmental words or tone in your questions. As a researcher, you must approach your material neutrally, and you don't want to bias your respondents to answer in any particular way. Don't try to make them answer the way you want; instead, aim for honest responses.

- **Avoid using absolutes.** Absolutes—such as "always," "never," and "every"—may encourage respondents to answer untruthfully or may prevent the researcher from gathering useful information.

- **Carefully consider your response options.** First, you need to decide whether you should use open- or close-ended questions. Then, if you use close-ended questions, make sure the responses are exhaustive and exclusive.

Exhaustive responses mean that there is a possible and accurate response for every single respondent. Each subject should be able to find an answer choice that applies to him or her.

Exclusive responses mean that those answer choices don't overlap. A respondent may have trouble choosing between 2 responses, such as "agree" or "strongly agree," but he or she shouldn't have 2 categories that both apply, such as "female" and "age 25 to 40"—unless you want to allow respondents to choose every category that applies.

- **Avoid double-barreled questions.** These are questions that ask 2 questions under the guise of asking only one. It usually happens because you are trying to cram a lot of ideas into a single question and don't realize that the response to one part of the question might be different from the response to the other. That's the danger of the double-barreled question: You can't rely on the results

An **open-ended question** does not offer any suggested response options; it lets the respondents say whatever they like in response.

A **close-ended question**—typically called a multiple-choice question—offers a set of possible responses that the respondents pick from.

There are benefits and drawbacks to both of these question types.

- Open-ended questions are less restrictive and let people offer responses that you, as a survey creator, may not have considered. They are also great if the list of options is too long or if including a list might bias the responses. They can be difficult to code, however, as you will need to analyze the responses to find commonalities between respondents.
- Close-ended questions are much easier to code and typically take less time to answer, but restricting the possible responses can force people into choosing options that don't quite fit. The order of those responses can also matter; subjects may look at a list and pick the first one that applies to them without reading the rest.

because you don't know which part of the question your respondents are answering. To get accurate results on both of your ideas, you need to ask about them as separate questions—so that you're not forcing your respondent to choose which part of the question to answer accurately.

- **Adapt from existing resources.** Survey research has decades of history, and there are many guides on how to write good survey questions. Drawing on existing models not only lets you take advantage of expert advice, but also allows you to potentially compare your results to those of other researchers investigating similar subjects. Existing resources will also advise you on important issues, such as question order. Use these resources and adapt them for your needs, rather than starting from scratch.

Survey research software can help you quickly build a survey with all kinds of different question options—not just open-ended and multiple-choice questions, but check boxes, rank-ordering items, and scales. Even better, they can produce reports for you, running basic descriptive statistics and showing you graphs and tables so you can see patterns in the responses.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, ch. 8.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 24.

13

Understanding Election Polls

An unscientific poll is one where respondents are chosen unsystematically, usually by some method other than random selection. In contrast, a scientific poll is one where respondents are a random sample of the population. This way, you can generalize from the sample to the wider population and make strong claims about respondent attitudes.

UNSCIENTIFIC POLLS

- Until mid-20th century, most polling was unscientific. People would be asked for their opinions, and anyone who responded would be included in the results. There was little effort to monitor or control who was participating, and this led to quite a few mishaps in polling.
- One widely used type of unscientific poll is called the straw poll—an informal, unofficial measure of public opinion. There is no random selection, requirements of sample size, or any of the other hallmarks of a scientific poll.
- Almost all of the early public opinion polls were straw polls. In some cases, they were quite accurate. In 1896, for example, *The Chicago Record* predicted how Chicago voters would vote in the presidential election between Republican William McKinley and Democrat William Jennings Bryan within a tenth of a percentage point. But despite receiving 250,000 ballots back, the poll was only accurate in Chicago; in other areas surveyed, it was wrong.

Why is it called a straw poll?

As the story goes, it is because straw polls measure which way the wind of public opinion is blowing—as farmers used to determine the direction of the actual wind by throwing some stalks of straw in the air and watching what happened.

- Perhaps the most famous example of unscientific straw polling at work is that of *The Literary Digest*, which conducted the earliest widespread polling of a presidential election in the United States. For 4 straight elections in the 1920s and 1930s, it correctly predicted the winner of the election.

- In 1936, it was poised to repeat this feat and sent out 10 million surveys asking respondents to indicate their voting intentions. Amazingly, more than 2 million Americans returned their surveys. And they spoke loud and clear: Republican Alf Landon would win the 1936 presidential election over Democrat incumbent Franklin Delano Roosevelt—and he would do it in a landslide.

- Except there never was a President Alf Landon. In fact, he only won 2 states in the Electoral College and received barely more than a third of the popular vote. Why was *The Literary Digest* poll so much less accurate than that of *The Chicago Record*? Among other reasons, *The Literary Digest* poll was unscientific.

- But not every poll got it wrong in 1936. Using new methods of selecting respondents, a pollster named George Gallup correctly predicted the outcome of the presidential race within 1 percentage point. And he did so with only 50,000 respondents—a fraction of the 2 million used by *The Literary Digest*. Gallup is widely credited with the founding of scientific public opinion polling in America.

- From that date forward, scientific polling became the norm. But that does not mean that unscientific polling has completely disappeared. Actually, it's still quite common. For example, reality TV shows let viewers vote or not vote as they wish to determine the winners of programs such as *American Idol* and *Dancing with the Stars*.

THE 5 RULES OF GOOD POLLING

- **Use a random sample.** A random sample is one where every member of a given population has the same chance of being included in the sample. The population is the universe of cases you are interested in studying, and in public opinion research, that means people. A population is typically too big to study effectively, so researchers use a sample, or subset of the population, instead. The most important thing that distinguishes a scientific poll from an unscientific poll is how the sample is chosen. Let's say you want to understand differences in how beagle owners train their pets. Your population in this case is beagle owners. Let's say there are 10,000 beagle owners in America. If you want to draw a random sample from those owners, then each one of those 10,000 beagle owners would have an equal chance of inclusion in your sample. That is a random sample. This kind of sample is much better than a nonrandom sample because nonrandom samples are much more open to bias. When you use a random sample, the world of probability theory opens—which means you can statistically estimate the likelihood that your sample represents your population. That means you can actually report on how likely it is that your results correctly predict how the wider population thinks. In a nonrandom sample, you can't. Because ultimately you care about the population, and not the sample, this is a big problem.

- **Use a large-enough sample.** If you have too few people, you introduce a higher risk of biasing your sample so that it does not reflect your population. But the sample has to be large enough to allow for random chance to work its scientific magic. The right size for your sample depends on your population, but most national public opinion surveys with adult Americans as their population use at least 1000 people, so that is a good number to look for if you have a large population.

- **Minimize sample bias.** Sample bias occurs when your sample does not represent your population. Avoiding sample bias is very important. The trick to scientific polling is that you can have a reasonable level of confidence that your estimates are accurate. You have to minimize the chances of overconfidence. One way to do this is to ensure that you have a complete list of your population to draw from when you make your sample. If someone is not on your list, he or she has no chance of being included in your sample. Another cause of sample bias is nonresponse bias, which occurs when some groups systematically refuse to respond to surveys. For many surveys, 20% to 30% or more of the people researchers contact are nonresponders. Sometimes this percentage is as high as 80% or 90%. This by itself is not necessarily a problem. The challenge is when there is something systematic about the nonresponders that affects the sample.

In national public opinion polling, many polling firms conducted polls in the past by calling landline telephones with phone numbers listed in the phone book. A few decades ago, that was a perfectly reasonable way to build a sample.

But today, more than 50% of the population does not use a landline—only a mobile phone. And the mobile phone users share some unique traits, such as being in general younger than the landline users, so relying solely on landlines could lead to a biased sample.

- **Minimize bias beyond the sample.** There are numerous ways in which poll results can become biased, but the following are a few main ways.
  - Pay attention to how the question and answer choices are worded and organized. How you write your survey matters a lot in the results that you get, and if you use misleading questions or a lot of jargon or try to influence your respondents in a particular way, you'll introduce bias into your results.
  - Sometimes people are unwilling to admit to beliefs that might be viewed as unpopular, shameful, or uninformed. They may claim to know more than they do or, in some cases, indicate that they hold an attitude they really don't. When respondents tell the interviewer what they think the interviewer wants to hear or what they think is the socially acceptable answer, this is called social desirability bias.
  - Be on the lookout for who commissioned and conducted the poll. If the group that paid for the poll or ran the poll is biased in a particular direction or hoping for a particular outcome, then those results should be scrutinized very closely—particularly if the results confirm their point of view.

The Bradley effect is an example of the social desirability bias. In 1982, polls showed that Tom Bradley had a lead in the California gubernatorial election, but he ultimately lost. Some analysts attributed the loss to Bradley's race, claiming that people were less likely to report in polls an unwillingness to vote for a black candidate.

- **Ensure a transparent methodology.** In simple terms, good scientific polls report their methodology in a transparent way. Transparency means that whoever is reporting the poll information reveals the full methodology of how the poll was conducted and does not attempt to mislead readers by leaving out information. How polls are reported matters. Sometimes polling analysts don't report options like "undecided" or "unsure," lest they muddy up the otherwise clear message of a graphic. Or analysts might overemphasize a single poll when really averages and trends are what should be reported.

TRANSPARENCY IN POLL REPORTING

- At a minimum, a good poll will report the following key information:
  - the questions and possible response options;
  - the full breakdown of responses, including responses like "don't know" and "unsure";
  - a breakdown of how the surveys were conducted (via telephone, in person, or online); and
  - a clear disclosure about who commissioned and conducted the survey.
- A good poll will also have clear reporting on
  - the sample size;
  - the method of sampling;
  - the response rate;
  - how samples are weighted;
  - the dates the survey was in the field; and
  - the margin of error.

- The final 3 are the only ones that have not been covered by previous rules.
  - **Weighted samples.** Most modern pollsters use weighting to adjust the sample's results to reflect particular demographics in the population. If a group represents 10% of the population but only 1% of the sample belongs to that group, the pollster will typically weight the final results to increase the effect of the responses of those 1%. You want polls to let you know whether weighting was used and, if so, how it was done. You should see both the original, raw results and the final, weighted results.
  - **Survey dates.** The survey dates are important because they matter. Imagine if you did a poll about terrorism prior to 9/11 but 2 months later, when you published your results, you left out the dates. That would leave out some incredibly important context for your study, and it wouldn't allow for valid comparisons with other research.
  - **Margin of error.** The margin of error is a measure of how precise and confident you are in your survey results. There is always a trade-off in polling between accuracy and precision. The margin of error is a statistical calculation based on the estimated result from your sample, the sample size, and the level of confidence—or accuracy—you want to have. It gives you a range around your original estimate in which you can be highly confident. In most large national polls, this is around 3%. Typically, you want to use a 95% confidence interval. That means you acknowledge that 5 times out of 100, your estimate is wrong. You could improve that level of accuracy—say, to only once out of 100—but if you do, the margin of error will increase, reducing your precision.

On November 8, 2016, voters cast their ballots for the 45th president of the United States. For much of the race, Democratic Party candidate Hillary Clinton had maintained a 3- to 6-point average lead in the national polls over Republican Party candidate Donald Trump. But what actually happened is widely considered one of the most shocking election results in world history.

The polls in the 2016 presidential election, although scientific, failed to follow all 5 rules of good polling. While they used random selection and large enough samples, they failed to minimize error in the sample thanks to low response rates, exclusion of key groups of people, and likely voter models that underestimated enthusiasm for Trump.

They also suffered from other forms of bias, such as the social desirability bias of shy Trump voters. And while the pollsters themselves were mostly transparent about their methods, media organizations did not always remain neutral or give context to their reporting, leaving people with the mistaken assumption that Clinton was sure to win.

READINGS

Enten, "13 Tips for Reading General Election Polls like a Pro."

Silver, *The Signal and the Noise.*

14

Research by Case Study

When you have a small *n*, survey research and experimental designs are typically not options. Instead, researchers turn to case studies and small-*n* comparative designs. A case study is an analysis of either one or a small number of cases with the goal of in-depth and multifaceted understanding of the complexities of the chosen cases. It is frequently used in professional fields such as law, business, and medicine as well as the humanities and social sciences.

THE SINGLE CASE STUDY

- Case studies are not based on a single document or source but involve the rigorous gathering and analysis of multiple sources, qualitative and quantitative. They can be used for a wide range of research: description, exploration, explanation, or application. The subjects of your case study—your unit of analysis—can be people, groups, communities, organizations, businesses, events, relationships, processes, countries, or whatever you want to study.

> The single case study is a powerful tool for research. Most people become interested in research projects because a particular person, organization, or event sparks their interest, and it is through their interest in cases that they can both form research questions and answer them.

- Case studies are very different from the other research designs you've learned about. Unlike with an experiment, you have a limited ability to control or manipulate your variables or assign cases to groups. While you can randomly select the cases to study, usually you want to use a more purposive method of selecting. You select your cases because of their attributes—because those attributes are typical of other cases, provide an interesting counterpoint or exception, or in some other way add to your knowledge of this phenomenon.

- You are also not engaging in large-scale comparison across space or time, as correlational studies do. In such circumstances, you tend to have more cases than you do variables. Case studies are an example of research where there are many more variables present than cases. That makes it quite difficult to establish correlation or causation that can be applied more widely.

- When it comes to survey research, you are typically trying to maximize response rates from a randomly chosen sample of a population. Surveys as a tool are, however, useful in case studies. Usually focused on a more limited and purposively chosen population, a survey for a case study is a way of gathering information about the particular case. The key difference is that a survey used as a tool in a case study is not usually meant to be generalizable to a wider population, whereas large-*n* survey research is usually aimed at doing just that.

- This is the key to understanding the case study: A single case study analysis is usually considered to have limited generalizability in and of itself—that is, case studies usually fall short on external validity. Combined with theory, however, a case study can provide a way of identifying broader applications. If the empirical results of the case study are consistent with or challenge the expectations of the theory that prompted the study, that can provide reasons to consider the potential broader applications of your case study.

- This is one reason why case studies often appear as an initial stage of explanatory research, a pilot study, or a plausibility probe to test initial theoretical ideas or as part of a mixed method approach. Just as you sometimes conduct preexperiments to see if a particular treatment has any impact, you might do a single case study to test your early ideas to determine whether further research is needed or to provide a rationale for a funding source to support your work.

- The limits on generalizability should therefore not stop you from doing a case study. The value is less in using your case study to explain or predict larger phenomena, but instead it lies in being able to deeply describe, explore, understand, or explain a specific case or set of cases. It can allow you to trace the causal mechanisms that get a particular case from point A to point B while taking into account the unique features of that case that a large data set covering many cases might not contain.

- For descriptive and historical research, a case study is valuable for its own sake, as it provides context and meaning that studies that are less in depth have trouble with. And for research in many fields, including professional fields and the social sciences, the case study is a popular and useful design in advancing knowledge.

If your goal is to explain a single case—and not to generalize to a wider population—then a case study is a good choice for your research.

WHEN A CASE STUDY IS USEFUL FOR YOUR RESEARCH

- Case studies can be particularly useful for hypothesis generation or plausibility probes.
  - **Hypothesis generation** means that rather than trying to test a case, you are conducting initial research to help generate a hypothesis from existing theory. This may be because you don't know much about the topic, the literature isn't particularly exhaustive, or the theory has not yet been subject to many empirical tests. Conducting a case study can help you generate hypotheses for your research question that can then be tested on other cases.
  - **Plausibility probes** are a kind of pilot study. You are testing the plausibility of your argument on an initial case to see if it warrants a larger study or to ensure that your methods of data collection and analysis are sound. This is very useful when trying to justify your work to someone who wants to see proof of concept before providing funding.

- In general, you want to use a case study when you want to investigate one or a small number of cases in great depth—either because of your own interest, the nature of the project, or the availability of data.

What are the particular applications that call for a case study?

Examining cases can lead to insights that might be applicable in other cases—particularly in the legal field, where lawyers can argue that precedents from previous cases should apply in a new case.

In business, case studies can identify opportunities seized on one venture so that similar situations can be spotted in the future.

In the medical field, noting particular cases of patients can lead to a greater understanding of the complex circumstances that surround the provision of care, which is of particular use for students.

TYPE OF DATA TO USE IN A CASE STUDY

- The case study benefits from using multiple types and sources of data. All the kinds of data you've learned about are up for grabs for a case study. Observation, interviews, focus groups, surveys, the results of large-*n* studies, and all kinds of documents should be leveraged by a researcher to produce a rich understanding of the case under study.

- This means that even though you are studying a single case, you are not necessarily limited to collecting data on a single subject. You might do a case study of a community or of the experience of a particular group of people. The community or group is your case study, but your data may be formed by interviewing dozens of people or conducting quantitative analyses of data for that region.

A FEW WARNINGS

- Your cases require variation. You can't have cases that all have the same values on the independent and dependent variables or your analysis won't say much. You need variation in your variables to use comparative case studies to say anything about correlation or causation.
- Remember that you are still testing your ideas. You can't use the same case to both generate your ideas and then test your ideas against that same case. This is difficult, because it's common for a particular case to inspire your interest in a project. And it's fine if it does. But if you develop your ideas and theories based on that inspirational case, then that case is not an appropriate test for your argument—it's built to pass the test.

- When done well, case studies are just as rigorous an approach to research as any of the other approaches you've learned about. Case studies don't release you from the other requirements you've learned about when it comes to design. You still have a research question and theory, and you still conduct a literature review. You still have to think about how you will measure your concepts and ensure that they are reliable and valid. You have to use systematic procedures for gathering and analyzing data. And you have to choose your cases carefully.

- Random selection is not usually used for case studies. With a small *n*, sometimes as small as 1, your sample size is so small that it doesn't matter how you select it—you aren't going to be able to make strong claims on that basis alone for generalizability. This means that purposive sampling is often used for case studies: You pick cases based on their values on your variables of interest or because the case lends itself to further, in-depth study.

CATEGORIES OF CASES

- Robert Yin suggests 5 categories of cases that generally apply regardless of your area of research: the critical case, extreme case, representative case, revelatory case, and longitudinal case.

    - The **critical case** investigates a specific application of an existing theory—the one where a case fits a specific set of predicted circumstances and for the theory to be considered supported it must explain that case. For example, if you have a theory explaining revolutions, you need to be able to explain the French Revolution or your theory isn't going to reach wide acceptance.

    - The **extreme case** examines deviant, or outlier, cases—the cases that have some kind of anomaly to them and therefore stand apart from more typical cases. Sometimes a case study of an extreme case is prompted by quantitative work that shows you patterns in your data.

For example, you might have created a scatterplot that maps out each case in your study according to its values on the independent and dependent variable. Most of your cases fall into a particular range, but one case is a clear outlier, falling far outside the expected or typical range. You might conduct a case study of that particular case to see why it doesn't fit the expected pattern.

With case studies, you are generally either in the business of replication—repeating a study on the same case as a previous author—or expanding—studying previously unstudied cases or an old case in a new way.

- The **representative case** looks at a typical case of the phenomenon. You basically pick a case that typifies a pattern you've found in the data. One way to do this is using *z*-scores, a type of calculation that lets you see how far a particular case deviates from the mean of all the cases on a particular variable. A *z*-score of zero means that the case falls exactly on the mean for the variable. So, you might look for a case that has a *z*-score close to zero on your variables of interest to find a typical case for your theory. Unlike the critical case, it's not a case that you have to explain for your theory to gain traction; it's a standard case plucked from among many other possible typical cases that is used to represent the average case. Choosing a typical case can be valuable, but it should still be an interesting case that is worthy of exploration.

- The **revelatory case** is a case that previously could not be studied but is for some reason newly available for analysis. This is an unstudied case that the researcher has new or special access to and is therefore positioned to provide useful new information.

- In the **longitudinal case** study, the researcher explores a single case not as a snapshot in history but over at least 2 points in time, allowing for an examination of change over time. It is similar to longitudinal experiments and studies but using the single case study approach.

Sometimes you don't want to do a single case study. You might want to see if successful results in one case are repeated in a second case, or you might want to subject your theory to further tests.

A comparative case study is a particular type of multiple case study. This isn't just repeating your case study on a second case, but a deliberate design to explicitly compare cases to each other. Comparative case studies are commonly used in the social sciences. They give you the in-depth exploration you get from a single case study but also let you explore correlation or causation through comparing cases. So, comparative case studies let you gain some of the benefits of both small-*n* and large-*n* designs.

In this method, you are still conducting in-depth studies of cases, but your choice of cases focuses on mimicking some of the controls you find in experimental designs. By choosing cases that are either very similar or very different, you can approximate in the real world the kind of laboratory controls that help you determine causality.

READINGS

Collier, "The Comparative Method."

Powner, *Empirical Research and Writing*, ch. 5.

Taylor Bogdan, and DeVault, *Introduction to Qualitative Research Methods.*

Yin, *Case Study Research and Applications.*

15

Interpretivism and Field Research

Positivism asserts that there is an objective, observable reality that can be studied. Using systematic design and data collection, one can figure out the "truth" that exists. Alternatively, interpretivists argue that there is no single objective reality that can be observed. Instead, everything is open to subjective interpretation, with the possibility of multiple layers of meaning and multiple truths. Interpretive work is therefore often less focused on testing theories. It focuses on a more inductive process of first gathering data and observations—not to test preexisting ideas, but to explore, understand, and interpret. Theory, if it happens, comes less from prior observation and logical principles than from interpretation of data.

What does the interpretivist approach call into question?

- The deductive approach to theory building and hypothesis testing is typically of less interest. The focus here is not on testing theories. Instead, you often start with no theories or expectations but instead gather data through observing people, analyzing their writings and artifacts, and talking to them. From there, you find themes and build theory.
- The idea of reliability of measures is also an issue. Reliability aims at ensuring that the measurement process is consistent, systematic, and value-neutral. Interpretivists question whether that's even possible.
- Researchers also often talk about the importance of random sampling, but that may not be the best approach here, either, as generalizing typically assumes that different subjects or cases can be treated as functionally the same. And because you interview particular people, not chosen at random, generalization is much more difficult.

When should you use interpretivist approaches?

- Choosing an interpretivist approach can be more like choosing a philosophy than a design for a particular project. Once you start walking down a path of rejecting the existence of objective, rational truths in favor of subjective realities, it can be a little hard to go back. Many researchers classify themselves as positivists or interpretivists for that reason. You don't have to take sides, but you should be aware of the philosophical differences between the 2 approaches.

FIELD RESEARCH

- One type of research where interpretivist approaches are widely used is field research. It can be done with either positivist or interpretivist methodologies. It can be inductive or deductive.
- Field research as an overall approach is a good choice when the data you need can't be acquired locally through other means. Maybe it isn't available in readily accessible data sets, documents, or existing studies. The data you need requires observation or interviews of your subjects—and that means you have to travel to wherever they are and study them on their own turf.
- This is called going into the field, and you might do this to do an experiment or survey, to conduct interviews for a case study, to visit an archive, or to conduct a focus group. In this sense, field research as a category is more about the location of your data collection than a research design in and of itself.

Ethnography is a particular type of field research that entails embedding oneself in the community under study, typically to engage in participant observation. It is a dominant methodology in the field of anthropology, and it focuses less on explaining outcomes or events and more on understanding a set of actors, a culture, or a community.

If your goal is to engage in research on communities and cultures through firsthand observation and analysis, ethnography is a good choice.

- There are a number of practical considerations to keep in mind before beginning field research. It doesn't have to mean flying halfway around the world and giving up everything to immerse yourself in an unfamiliar culture. The "field" refers to any location where you go to collect data on the local inhabitants. That might be in Bali or right in your backyard.

- Sometimes, though, your project will require you to travel to a location, and potentially stay there for a while. This means that field research can require extensive planning—and funding. You want to maximize efficiency while you are in the field. You most likely won't be able to spend as much time in the field as you want; at some point, you will probably have to return home. This means that you need to plan carefully for your trip to make the most of it.

    - **Consider how long you need to be in the field.** You might need just a few days, or weeks or months—or even years. The longer you will need to be in the field, the more funding you will need. Grants and fellowships are a good option; they can fund your travel and living costs as well as any needed supplies or assistance.

    - **Consider the timing of when you go.** What makes the most sense for your schedule might not be great for the local community. Be mindful of seasons, holidays, holy days, and local events.

    - **Make contacts with locals before you arrive.** This can be essential to ease your introduction into a community. In some cases, you might be able to arrange interviews ahead of time; other times, that's not possible. But do as much preparation for meeting your subjects as possible.

    - **Consider intercultural competence.** This is an essential skill. You need to know how to be respectful and responsive to the needs of your subjects, and you need to reflect on your own cultural biases while working with them. Your subjects are doing you a big favor by participating in your research, and you owe them respect.

Ethical considerations require you to engage in research that does not simply benefit you, but your subjects as well.

- **Get approval from your ethical review board.** Any time you are working with human subjects—observing them, interviewing them, or having them participate in surveys or experiments—you need approval from your ethical review board to ensure you are providing them with adequate protection from the risks of your research. If you are doing your research in another country, you will need to abide by the ethical standards in that country as well as your own.

INTERVIEWS

- Interviews are a very common way to collect qualitative data. Interviews are a great way to learn about the motivations of the people or actors you are interested in, gain subjective understandings of the success or failure of a program, and learn about the role of people in processes and decision making. They can be used to learn about the experiences of any population—from everyday people to specific populations. Traditional interviews allow you to go into great depth with individual people, listening to their perspective and hearing their story.

- Interviews are often done in person at a place of mutual convenience to both the interviewer and interviewee. But thanks to modern technology, they can be done without having to leaving home. Interviews can be done via email, chat, phone, or web-conferencing programs. Doing your interviews from a distance can be a great way to lower the costs of getting your data; you may not actually have to go into the field at all.

- The biggest issue with interviews is access. It can be very difficult to find subjects willing to talk to you. You are asking people—potentially very busy people—to give you 30 minutes or more of their time for your project, often without any compensation. You may be asking them to talk about sensitive topics and to potentially record their responses. Promises of confidentiality and the benefits of your research may not be enough to get someone to talk to you.

- This is why many people who do interviews use **snowball sampling**. A snowball sample is one where you identify one or more subjects and then ask them to introduce you to additional subjects. Identifying and gaining access to one subject is a more achievable task. Their introduction can serve as a proxy for the insider status you don't have; you are relying on the connections and reputation of your initial contact to gain access to new people, rather than your own.

- But there are downsides to this. Because your sample isn't random, you can end up with a biased, unrepresentative sample. Your contact is more likely to introduce you to friends and allies than those who might contradict his or her viewpoint. You might need several snowballs for that reason.

- Another issue is that this process can take time. Instead of scheduling a bunch of interviews ahead of time, you are relying on each subject to introduce you to more people. Those people will then need to be scheduled—either for later in your trip or perhaps by phone or web conference after you return.

- Once you've solved the access problem, you still have to be prepared for the fact that your subjects may lie to you or at the very least will tell you their truth—not necessarily a representative perspective. Triangulating what you are told against other sources of data can be helpful in separating truth and fiction.

- You also have to guard against your own assumptions and biases that you bring to the table. Your subjects may tell you things that don't fit your understanding of events or that you think are wrong. You need to recognize when your preexisting beliefs and biases are affecting your responses to a subject and try to stay as neutral as possible. Otherwise, your data will end up biased in favor of telling the story you want to tell.

- Finally, you need to make sure that you are utterly prepared. You should do a thorough review of all the secondary sources of data you can find before starting any interviews. Otherwise, you risk wasting your time and that of your subject; you won't know what questions to ask or will ask him or her things that you could easily have found out through other sources. You have a limited amount of time with each person. Maximize it by making sure that every question you ask is one you couldn't have had answered in another way.

- Once you've settled on a type of interview, you need to consider how you will keep track of the data you collect.

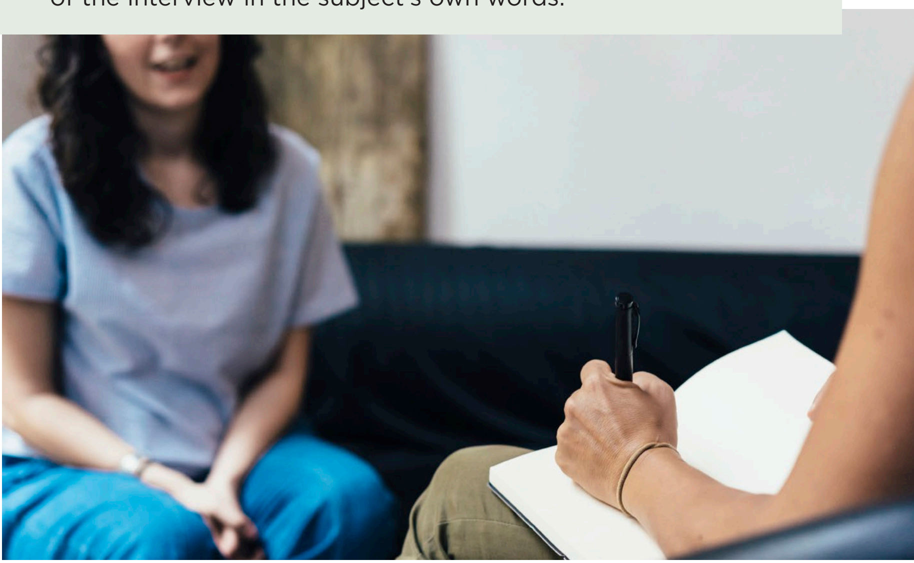
- You have 3 basic options for recording your interview data obtained from a face-to-face interview: You can record the audio or video of the conversation, take notes during the conversation or have someone do that for you, or write down your recollections after the fact. There are advantages and disadvantages to all of these.

  - **Recording the interview** will ensure the best record of the conversation. But you have more of a reactivity problem here. The subject, knowing he or she will be recorded, may be less forthright with his or her true opinions. This is why it is essential that you review your protocols with them—including promises of confidentiality, anonymity in quoting, the ability to review the tapes afterward and strike anything from the record, and potentially the destruction of the raw recordings following transcription. Reviewing those assurances will reassure many subjects. But some will still hesitate to be completely honest.

  - **Taking notes** instead of recording can solve this problem, but it creates a new one. If you are focused on taking notes, it may inhibit your ability to create rapport with your subject. With semistructured and open-ended interviews, this can be a real concern, as you have to both write down what your subject has already said and think of follow-up questions. Unless you know shorthand or are an incredibly fast notetaker, you will also likely miss some details and be unable to produce exact quotes for later.

- ▷ **Taking notes after the interview** avoids the reactivity issue of recording the interview and the impersonal interaction and risk of distraction that arises from taking notes throughout. But it is the least likely method to produce an accurate record of the conversation. You will be making subjective judgments immediately on what were the "important" parts of the conversation, which can lead to biases in the data collection. And you might not have time to sit down immediately and record what you remember, in which case you might lose data.

- ◇ If your interview is not face-to-face, you have other options. If you are using a phone or web-conferencing program, you are already interfacing through technology, so taking notes while the person is talking might not feel as impersonal as it can when face-to-face. Another option is to conduct the interview over email or chat, which gives you a written record of the interview in the subject's own words.



Interview question styles are typically divided into 3 categories: structured, semistructured, and unstructured.

- **Structured interviews** are functionally the same as a survey. This type of interview is a set list of questions that does not change from person to person. Everyone is asked the same questions regardless of their responses. For that reason, the interviewer doesn't play much of a role in the interview itself. This is why this style of interview is typically done as an oral or written survey.
- An **unstructured interview** is the exact opposite. This is entirely open-ended. The interviewer typically doesn't have a list of questions; instead, control of the conversation is largely in the hand of the subject to tell his or her story however he or she wants. Each interview is unique and based entirely on the interaction of the subject and the interviewer. If you wanted to hear someone's personal narrative of some experience they had, this is generally a good style.
- The **semistructured interview** is perhaps the most typical and common type of interview. It is a combination of the structured and unstructured styles. Like a structured survey, the interviewer may have a list of questions or just some topics and themes that he or she plans to ask to all subjects. But like unstructured surveys, there is freedom for the interviewer to tailor questions to the particular person, ask new questions as follow-ups, and allow the interview to go into unplanned directions.

OBSERVATION

- Another prominent method is that of observation. In field research, observation is about observing the behavior of subjects in the field—in their local environment, not in the artificial construct of the laboratory.

- Observation can be direct or indirect.
  - **Indirect observation** is where you observe the indirect behavior of your subjects, perhaps by reviewing and recording the objects, evidence, or artifacts they leave behind.
  - **Direct observation** is where you observe your subjects directly—not the aftermath of their behavior, but the behavior itself.

- Observation is great because it lets you, as the researcher, assess the behavior of your subjects without their perspective interfering. You aren't asking people how they would behave; you are observing their behavior yourself. So, there's less risk of people forgetting or lying to you about their behaviors—particularly those they might have a reason to hide.

- On the other hand, it means you will lack the context of knowing about their motivations or justifications for their actions, so you can run the risk of making assumptions about why people behave the way they do. This is one reason why observation and interviews combined together can be very effective sources of data.

- The key to good observational research is to take excellent notes and record whatever you can. But even when you have excellent recordings, you will need to supplement this with your own observations of what else is going on. You need to be as comprehensive as possible, because often in the moment you won't know what is important. That

One of the key kinds of observation, commonly used in ethnographic studies, is **participant observation**. This basically means you are not only an observer, but, to some degree, you are a participant in whatever community or society you are studying. The goal is to learn about the culture or society from the perspective of the members of that culture or society. The level of your participation—and how aware the community members are that you are a researcher—can vary.

means recording whatever you can about the who, what, when, where, why, and how of the people, community, and environment that you are observing. You will want to review your notes regularly to mark anything of importance and to begin your analysis.

- As with any method, observation has some drawbacks.
  - **Observation can take a lot of time and money**, depending on your project. You can design a project that is smaller and more local, but true participant observation can require a significant investment of time.
  - **You have to consider biases in your data.** There's the reactivity problem of your subjects knowing they are under study. But you also have your own biases, such as your assumptions and preexisting ideas.
  - **Your analysis is probably going to be restricted to the group or community under study.** It may be difficult to generalize your results to other groups, as participant observation typically doesn't involve a lot of random sampling.

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Geertz, *The Interpretation of Cultures*.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 1.

Tracy, *Qualitative Research Methods*, ch. 6.

Yanow and Schwartz-Shea, *Interpretation and Method*.

16

Applied, Evaluative, and Action Research

Basic research is primarily focused on advancing general knowledge and explaining phenomenon in which you have an intrinsic interest. While you may have a specific real-world case that sparks your interest, the larger goal is typically a bit more abstract and general. But in many cases, your project may focus on solving a specific problem facing your company, community, or personal life. Practical research like this—which focuses on specific, real-world problem solving—is called applied research. Three kinds of research that are considered more applied than basic are evaluation research, action research, and product and market research.

EVALUATION RESEARCH

- Evaluation research is appropriate for questions about the need for, design, progress, and outcomes of a particular action. It uses many of the methods of basic research—experiments, surveys, case studies—but for an applied purpose. This is not about abstract concepts or ideas, but about finding solutions to problems faced by real people, groups, and companies in the real world.

> Applied research is typically about applying the findings of basic research to producing something new and usable. And basic research can give answers to all kinds of interesting puzzles that can inform policies and decisions. Both kinds of research are therefore valuable.

- It's typically used to evaluate policies and programs in businesses, organizations, and government. The goal is generally to assess whether a particular action or program should be initiated, continued, or terminated. Therefore, this kind of research has a normative rationale, and your results may therefore include normative recommendations on how your client should act.
- Evaluation research is similar to basic research in that it is still a systematic approach to knowledge creation with transparent

methodology and a neutral researcher. You still need to consider your variables of interest; that is, you need to know what outcomes you are assessing and consider the factors that influence the achievement of those outcomes. You also need to consider all the relevant issues with populations and samples and ensure that you can gain access to the subjects and data you need to conduct an accurate evaluation.

- Theory and causal mechanisms are just as important to this kind of research as they are to basic research. But other things are different. You, as the researcher, may be assigned your topic rather than choosing what you find intrinsically interesting. The rationale is often driven by demands for accountability or to justify the money, time, and resources that are going to be or have already been invested.

- As a result, this kind of research can be politically tricky. While you still need to be neutral, you may be under more pressure to reach a certain conclusion, as continuation of a program may depend on a positive evaluation from you. This can create an ethical quandary for you that will need to be navigated. Your results can affect lives, as jobs may depend on whether or not you recommend the initiation or termination of a program.

- Another difference is that typically in evaluation research, you aren't interested nearly as much in generalization. Your primary task is to evaluate the specific program or action—not to extrapolate from your findings to evaluate all such programs. You still need to maximize internal validity in your project, but the external validity may be less important.

- In terms of methodological design, all the methods you've learned about previously can be used in evaluation research, including surveys, experiments, and case studies. All of the trade-offs you face in picking a design for basic research apply here—and in some cases more so, because you may be constrained not by your own resources or timeline, but those of your client.

- There are a few kinds of studies that can be done in evaluation research.

    - **Needs assessment.** Similar to a diagnostic study, a needs assessment is often completed before a new program or action starts. The researcher assesses the status of the organization, business, or group of interest and considers its needs. This may include diagnosing inefficiencies in operations, areas of success and weakness, avenues for new opportunities, or changes desired by users. Typical methods for a needs assessment or diagnostic study include surveys, focus groups, and interviews with stakeholders. All of this typically occurs prior to program creation, as the results will themselves drive the creation of the program.

    - **Formative assessment.** This type of assessment evaluates the implementation of a new or ongoing program. The goal here is not to evaluate whether the program or action has met its stated goals, but to provide feedback on the current structure and processes to improve the delivery and implementation of the program. Surveys, interviews, and focus groups again will be instrumental here, as will analysis of documents.

    - **Summative assessment.** This is where you are assessing the impact of the program or action, how effective it has been at achieving its stated goals, and other outcomes of interest. Then, you are essentially giving the program a grade and ultimately indicating the ways in which it has been successful—or not. Surveys, focus groups, document and data analysis, and interviews are still useful here, but you might also conduct quasi experiments.

- These 3 different types of evaluation studies take place at different stages in the lifetime of a program—before, during, and after. Depending on the needs of the client wanting the evaluation, you might do just one of these or a combination.

ACTION RESEARCH

- Action research aims at finding collaborative solutions to specific real-world problems for a group of actors in a community and is typically conducted by professionals operating in a particular area and working with the community members. Unlike basic research, it is not focused on generalizing results but instead on solving a particular problem.

- Similar to evaluation research, action research is less about the puzzle or question that interests you and more about what is needed by a particular community or group. It is central to research in education, health care, activism, and human rights for those reasons. Where it differs from evaluation and other types of research is that the practitioners and members of the community are actively involved in the research—not simply as the subjects that you study, but essentially as part of the research team.

- Action research is largely considered to follow a cycle. As with most research, you start with a research question or problem, but that problem may not be defined by you, the researcher, but instead by a community of interest. You will ask them about their experiences and how they understand the problem. Once you've defined the problem, you then introduce some kind of change or treatment and then observe not only the effects of that treatment but also the process of implementation and the responses of the community to those changes. After evaluating all of this, you then make further adjustments, treatments, and changes, repeating the cycle until the problem is addressed.

> Like evaluation research, the distinguishing feature of action research is not so much its methods of design, data collection, and analysis, but its purpose.

- In a way, action research can be considered a democratized type of research, where the opinions and decisions of the researcher are not followed in an autocratic way. Subjects don't simply do as the researcher dictates but are involved in decision-making and benefit directly from that involvement.

In his book on action research, Ernest Stringer has a simple framework for approaching action research: look, think, act.

- You define your problem that you aim to solve. Then, you **look**—observe and describe the specifics of the situation so that everyone is fully briefed on the full scope of the problem.
- Then, you **think**—analyze the available data to understand how and why this problem came to be.
- Then, you **act**—determine what change or action is needed, implement the change, and observe and assess the results.

You repeat this cycle until your assessment shows that the initial problem has been solved.

- Note the differences between action and basic research. With basic research, you conduct a study to answer a question, but that question might be abstract, and answering it does not necessarily make a difference. You acquire knowledge and communicate it, but change, if it happens, may be incremental, and you may not even be aware of the impact of your research.

- The cycle of action research occurs in a complex context of actors or practitioners who face a particular problem that they want or need to solve. The research aims at addressing that particular problem, with the researcher acting as an agent of change, not simply an observer. The goal is to solve that problem—not simply to publish findings.

- For basic research, the stakes are often personal: You have a question that interests you that you want to answer, or you are incentivized to do this research by your job. The stakes in action research are broader; they originate from those outside the researcher, who are heavily invested in seeing results.

- The same thing goes for the role of the ideas of the researcher. In most research, the ideas and interpretations of the researcher are paramount, and you often assume that a set of ideas that works in one context will work just as well in a similar context. In action research, the experiences, ideas, and interpretation of the community members are as important—if not more so—than those of the researcher. And the specific context of the particular community, and the complexity of that context, matter a lot. You don't assume that programs or changes that have been successful in one environment will work just as well in another.

- If you've decided you want to engage in some action research of your own, how would you do it?

    - First, you have to identify a community to aid. This may be a community you already belong to and want to assist or a new community that faces troubles that you think your expertise might be able to resolve. Or you may be brought in by a member of a community to assist them with tackling a particular problem.

    - Once you've found the community that could benefit from action research, you have to clearly define the problem that needs to be solved. People in a group may know they have a problem, or multiple problems, but may differ on how they characterize that problem. You'll need to get a complex understanding of the entirety of the issue they face so you can be comprehensive in your approach to solving it.

    - You also need to determine clear key indicators of both progress on and the resolution of the problem. Once you know what those indicators are, you need to determine your baselines so that you know where you are at the start.

    - Next, you need targets—both short- and long-term ones. Sometimes if you just focus on the final long-term goal, the community can become discouraged because the target seems too far away.

- Finally, you need a way to measure progress on both targets and outcomes. This may be a test, a self-report, or your observations.

- Once you and your participants have determined your outcomes, indicators, baselines, and targets, you are ready to take your initial measures. Then, you introduce the agreed-upon changes. You continue to monitor progress, taking measurements and checking those against the baselines as well as consulting with the participants on their experiences. Data can be collected through many different methods, such as interviews, surveys, observation, document review, or focus groups.

- As you analyze the data, you might determine new problems that were previously not considered and need to be addressed. You recommend changes in light of this new information and continue to check the indicators to see the effects. The cycle continues as needed—always with the input of the participants, who are the ones that are ultimately responsible for creating the processes and change that could lead to a resolution of their problem.

MARKET AND PRODUCT RESEARCH

- Market and product research focuses on determining what people—consumers—want. That means that it aims at determining the preferences and interests of potential consumers and tailoring programs and products accordingly. There are several methods of doing this kind of research, including interviews, surveys, experiments, and comparative case studies.

- Another way to do market and product research is through focus groups, which let you interview small groups at once. They can be a nice alternative to interviews when you have a shorter window of time to talk to subjects. You can talk to several people at once, rather than in one-on-one interviews, so they can be an efficient and relatively inexpensive way of getting individual perspectives. They also allow for interaction between subjects in a discussion format.

- This can be particularly useful if you want to observe social dynamics and how people respond to each other. In this way, focus groups can be a good combination of interview and observation. The group setting also allows for creativity, which is why focus groups are often used in market research. You can give the group a particular product and time to use it and then observe group members' interactions and get their reactions.

- But there are drawbacks. Running a focus group requires considerable skill on the part of the moderator. You have less control than in a one-on-one interview, because there are a lot of people involved in the discussion. This means that you will cover less ground and the group can go off topic or be dominated by a few voices. The same dynamics that might inhibit truth telling in a one-on-one interview can operate in a group setting, where subjects fear immediate social repercussions for saying something unpopular.

- This is one reason why many focus groups are now run in an online setting. The relative anonymity of the online setting can lower inhibitions against sharing personal information or potentially controversial opinions. It also allows you to include a wider diversity of people in your focus group, as your participants need not be physically located in the same place.

When conducting a focus group, keep in mind that the claims you can make about your results may be limited. The typical focus group may have no more than 10 or 12 people in it, which means that even if you choose your subjects randomly, it's unlikely that you'll have a representative sample. This means that you can't necessarily generalize from the results of your focus group.

This is one reason why researchers will use multiple focus groups or combine the focus group with other methods to ensure a broader set of perspectives.

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Krathwohl, *Methods of Educational and Social Science Research*, ch. 23.

McNiff, *Action Research*.

Stringer, *Action Research*.

Vanderstoep and Johnston, *Research Methods for Everyday Life*, chs. 9–10.

17

Gathering and Preparing Data

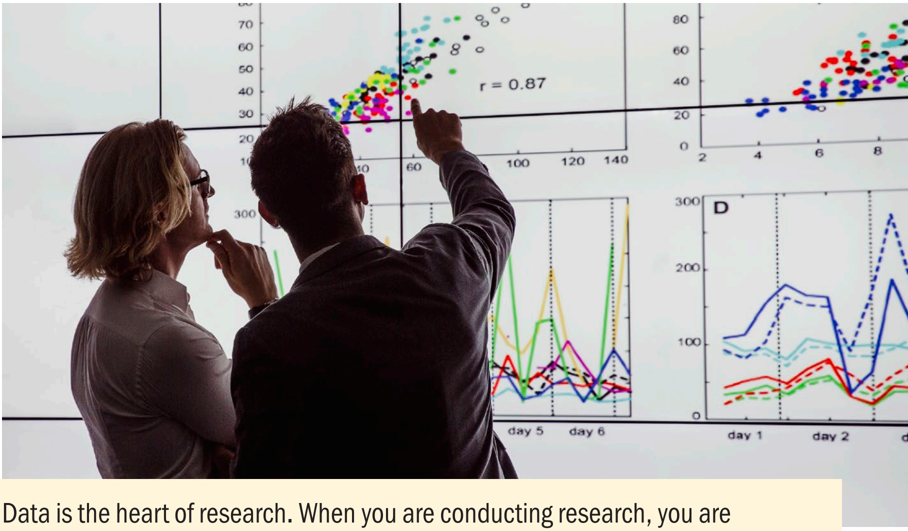
Once you've chosen the research design that is best suited for your project, you are ready to learn the next step in the systematic process of conducting research: analyzing the data that you have gathered so you can address the problem, puzzle, or question that prompted you to begin the process in the first place.

ASSESSING YOUR DATA

- The data you've acquired likely comes in one of a few forms. You may have a mix of several or all of these forms of data, depending on your study.

  - **Data from an experiment.** This will consist of the information you've drawn on your subjects and your variables of interest. For each subject, you'll know his or her value on the independent variable—whether or not he or she received the treatment. And you'll have at least one set of measures for your dependent variable. If you conducted a posttest-only study, you'll have whatever data you acquired for that posttest. This might be answers to an actual test, a survey, or your observations of subject behavior. If you also conducted a pretest, you'll have double this information.

  - **Interview data.** This data comes from directly interviewing your subjects as individuals or groups and recording their responses in video or audio or by taking notes. These interviews might be completely unstructured, where you allow the person to tell his or her story any way he or she wants to. It might instead be highly structured, where each person answers a set list of questions that does not alter regardless of his or her responses. Many interviews blend these 2 methods into a semistructured format, where you have a list of questions or topics but also ask follow-up questions based on the responses your subjects give you. Regardless of how you conduct your interview, you'll end up with notes or a transcript that can then be analyzed.



Data is the heart of research. When you are conducting research, you are systematically collecting and analyzing data.

- **Survey data.** When you have your subjects fill out a questionnaire of some kind, that is called taking a survey. For each subject, you are going to get a number of responses on a set questionnaire. The close-ended responses can be input directly into a spreadsheet, while the open-ended responses might require either coding or qualitative analysis. While interviews tend to focus on a smaller number of subjects and don't always use random selection, surveys tend to aim for a larger number of responses gathered from a randomly selected set of respondents.

- **Observational data.** This comes from direct or indirect observation of your subjects. Generally, your data will be in the form of field notes from observing behaviors and events, but it can also include information from focus groups about their reactions to stimuli, such as facial expressions during a speech or while watching a film.

- **The written record.** Unlike the other forms of data that have been discussed, the written record is typically not originally collected by the researcher and probably not for the purpose of scholarly research. Instead, this is data found in documents—government and business records, statistical databases, news sources, videos and film, historical archives, and various primary sources. You may use this written record to create new data sets.

Content analysis is the systematic analysis of the written word, usually communication materials such as news articles or speeches. Coders—human or computer—can search these materials and identify themes, tones, word choice, people, and other items of interest, producing numerical counts of how frequently these items are found. Thus, the written record is transformed into numbers that researchers can input into a spreadsheet.

- Regardless of its origins, your data will eventually be in one of 2 broad forms: quantitative or qualitative.
    - Quantitative data largely consists of numbers that lend themselves to statistical analysis. It is usually called large *n*, with *n* representing the number of cases. Quantitative data consists of quantifiable information about a large number of cases.

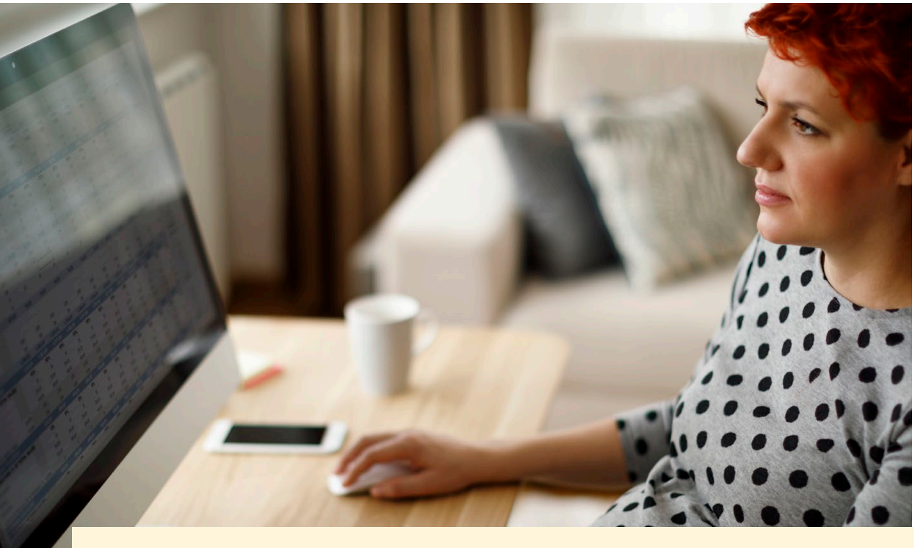
- Qualitative data usually cannot be put into numerical form so easily. It tends to be more descriptive or process oriented; therefore, reducing it entirely to numbers would eliminate the richness of the data. It is sometimes called small *n* because the depth required for each case is large enough that it is not viable to collect data on a large number of cases.

- This is not a clear-cut line, though. Qualitative research can use numbers, and quantitative data regularly has nonnumerical information in its spreadsheets. Researchers will frequently assign numbers—such as 0s and 1s—to data that don't have any meaning in and of themselves just to allow them to analyze the data.

- Look at your data. Do your variables fall into clear values or categories that could be represented by numbers, if they are not already in numerical form? Do you have the same information on each case—the same variables, easily marked with their values? If so, your data is probably quantitative in nature. If not—if you have very few cases, if your data is largely descriptive or narrative, if you can't clearly note the values that each variable falls on, or if your data just doesn't lend itself to systematic numerical form—then you are working with qualitative data.

Back up your data regularly. Use a cloud service to ensure that your data backs up automatically, save it to a flash drive or external hard drive, and/or email yourself regular copies.

Keep in mind any IRB requirements for your data. If you have confidential data, you will need to protect it. This means that hard copies have to be in a locked location and digital copies need to be password protected. If your IRB requires you to destroy your hard data, you must do so after processing the data. If not, hang on to your raw data; it can be very useful for replication and for your own reference.



The rest of this lecture focuses on quantitative data. If your project focuses entirely on qualitative data, a later lecture addresses strategies for working with data. Generally, though, there is less data cleaning that needs to be done with qualitative data because you won't be running your data through a statistics program.

PREPARING AND CODING YOUR DATA

- Once you have your data, you have to start organizing, preparing, and coding it. Before you can analyze your quantitative data, you have to take the raw data and put it into a format that is usable. That usually means putting it into a spreadsheet.

- Spreadsheets are an incredibly useful cornerstone of large data sets. Most data sets—such as the General Social Survey and census data—are available in a spreadsheet-readable format. You can then analyze the data in the spreadsheet program itself or, for more advanced analysis, import the data into statistics software.

- Spreadsheets are also great because everything is already organized by columns and rows, with a single cell for each datum. Your cases go in the rows and your variables go in the columns. You can have as few cases and variables as you like. It is also easy to run basic statistics in a spreadsheet program and to spot missing data before you run it through a more advanced program. A spreadsheet also allows you to pretty easily create new variables or cases.

- A spreadsheet may not be necessary, though. For many studies, you can input the data directly into your analysis software, or a computer may be able to read and enter the data for you. If, for example, you conducted a survey through an online platform, the data will probably already be organized for you.

- Regardless of how you eventually get your data into a usable format, an essential part of the process is coding, which involves transforming your raw data for analysis.

- Remember, quantitative analysis means that you are analyzing numbers—but lots of your data is not necessarily in numerical form. For example, if you were reviewing data on eye color, you would have to turn peoples' eye colors into numbers. Coding is how you do that.

- You determine the variable—in this case, eye color—and give the variable a name. Typically, the name should be short, in all capital letters, and an abbreviation of the full name of the variable, perhaps EYE in this case. You do this partly to keep the columns a uniform and narrow length. Then, you code the variable by assigning numbers to all the values, perhaps 1 for blue and 2 for brown.

- You might instead want to code 2 separate variables: one for blue eyes, perhaps EYEBL, and one for brown eyes, such as EYEBR. Those would then be coded as 1 if the person had that eye color and 0 if not. These 0/1, yes/no, it is/it isn't variables are called dummy variables.

- Once you decide on the variables and how each response will be coded, you code each respondent, entering the data into the spreadsheet—or having assistants or a computer do this for you.
- You repeat this with all the other data you've gathered. Hopefully, in your design you were clear about the variables of interest so that the coding is relatively straightforward.
- As you code, you create a codebook. At a minimum, this document explains your codes and what they mean. When you look at the spreadsheet and see EYE, you don't necessarily know what the researcher means by that. If you look at the codebook, you would see that EYE means the eye color of the subject and that a 1 means blue and 2 means brown.

You want to make sure that coding is done consistently (reliably) and accurately (validly).

- Coding is about taking raw data and transforming it into usable categories. You need to make sure that no matter who is doing the coding or when that it is consistent. Because you sometimes get help with your data entry, meaning that multiple people are using and interpreting your codebook, ensuring reliability becomes particularly important.
- There are a few ways to achieve inter-rater reliability: the kind of reliability that ensures that multiple coders are applying the same measures consistently. One way is to have more than one person code the same sample of data. You can then check to make sure that they are on the same page and coding consistently with each other.
- Sometimes it's not possible for one person to do all the scoring or coding needed by your project. In such cases, you will need to employ extensive training of the raters to ensure that they know how to apply the coding system.

- At their best, codebooks explain the complete process on how the researcher gathered and coded the data, such as who was involved in the project, how they defined their terms, how they identified their cases, and what were the sources of their data, the questions that guided the data collection for each treaty, and the specifics of each variable.

Once you've coded your data and set up your codebook, there's one more step before you can dig into the analysis. You have to deal with missing data.

Missing data is a part of research. Someone skipped a question on your survey, or you just couldn't get an answer on the case you studied.

Do your best to get a complete data set, but recognize that this is rarely possible. The only real problems are if so much data is missing that you don't have enough to analyze or if there is something systematic about the missing data. If everyone in your study left a particular question blank, for example, that might tell you more about your question than your study.

When you have missing data, you need to mark it as missing. You can leave the cell empty, but sometimes it's better to mark it with a number such as 9, 99, or −1. Statistics programs can be told what the value is for missing data and deal with it accordingly.

STATISTICAL DATA ANALYSIS

- When working with quantitative data, you need to use a data analysis program capable of doing the kind of analysis you need. There are dozens if not hundreds to choose from. Some are free; others are quite expensive. Some are rather simple; others are highly complex. In general, go only as complex as needed to answer your question.

- Highly complex statistics don't necessarily give you better answers than the easier, more basic calculations. For many of your projects, you will find that the basic analyses combined with visually appealing tables and charts are sufficient to answer your question and communicate your findings. Don't put in the work to learn a more advanced package unless you need to.

- Also, don't be afraid to find a mentor or collaborator. Even if you do get training in a particular package, it may be that on your next project, a different tool or set of analyses that you don't know would be better. You may find it easier—and get better results—from consulting with a statistics expert.

- For most of the statistical calculations in this course, you really only need a solid spreadsheet program. There are free ones available for general use, and it's relatively simple to do these kinds of calculations. Of course, more advanced programs can also do those calculations, generally with a push of a single button. But spreadsheet programs are widely available on most computers and are useful for many other tasks besides statistics, so learning how to use them in this capacity is a great skill to have.

- If you need to do more higher-level analyses, then you'll need something more specialized. And there are dozens of options.

    - **SPSS** (Statistical Package for the Social Sciences) is a commonly used tool for data analysis. While not free, it is very user friendly. It's widely used not only in the social sciences, but also by researchers working in fields such as health, education, marketing, and survey research.

- **R** has become a fairly popular data analysis package, and it has 2 strong advantages over SPSS: It's free, and it's capable of the highest level of analysis. But there's a drawback: You have to learn how to code in R in order to use it. That will require a large investment of your time to learn if you don't already have strong programming skills. If you are willing to put in the time, R is probably the best statistics package that exists, capable of pretty much any analysis you need. But if your project doesn't require work at such a high level, you may want to consider other options. (For more information about R, refer to *Learning Statistics: Concepts and Applications in R*, the Great Course taught by Professor Talithia Williams, PhD.)
- **Stata** is widely used in the social sciences.
- **JMP** is a package common in engineering.
- **SAS** is used for finance and manufacturing, among other uses.

READINGS

Abu-Bader, *Using Statistical Methods in Social Science Research with a Complete SPSS Guide*, chs. 2 and 6.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 12.

Powner, *Empirical Research and Writing*, ch. 8.

18

Using Statistics to Interpret Data

Now that you've explored a variety of methods for gathering and presenting your data, you are finally ready to analyze it. The first stage of data analysis is descriptive statistics: fairly simple calculations that help you describe your data. At this point, you are working with a single variable at a time and identifying 3 main things about it: its central tendency, or the middle of the variable; the variation within the variable; and the frequency of particular values within the variable.

CENTRAL TENDENCY

- Central tendency is about calculating the middle, or center, of your data. If you've ever calculated an average, or mean, or a median or a mode, you've calculated central tendency. All these measures can be easily calculated in any spreadsheet or statistics program. Use them. It's tedious to do the calculations by hand or calculator, and humans are much more prone to mistakes than computers.

- The **mean**, or average, can be calculated by adding up each score—or data point, or value—and then dividing the sum by the number of scores. People use averages like this all the time, and they are a great measure of the middle of your data. But they do have some disadvantages. Averages are very susceptible to outliers: data points that differ significantly from the rest. Just one data point that is an outlier can change the average by a large amount.

- If you look at your data and see some outliers that might be influencing your mean, you have a few options.

  - **Trim your mean.** Eliminate a certain number of scores on one or both ends and report your mean as a "trimmed" mean. This keeps outliers from affecting the mean because you are outright excluding them from your calculations.

  - **Use the median instead.**

- The **median** is a measure of the middle where 50% of your data is higher and 50% is lower than that number. To calculate it, you order all of your data points from highest to lowest and then find the one in the middle. If you have an even number of data points, you take the average of the 2 in the middle.

- The median is not susceptible to outliers like the mean. Because you are ordering your data and identifying the "middle" value, it doesn't matter how big or small the other numbers are—you only need the one in the middle. Any time you suspect a skew in your data due to some outlying high or low numbers, use the median.

> The mean is generally the best measure of the middle, so long as the distribution of the data is generally normal and without a small number of very high or low numbers skewing the results (in which case, use the median).

- The **mode** is the most frequently occurring value in your data. If there's no value that repeats, then there is no mode. To calculate the mode, just count the number of times each value appears in your data. The one that appears most frequently is your mode.

- The calculations you can do depend very strongly on the kind of data you collected, particularly its level of measurement. In general, there are 4 levels of measurement.

    - At the **nominal** level, you have different but unrankable categories, such as with marital status or ethnicity.

    - At the **ordinal** level, you can rank your categories in order but can't establish distance between them. A 5-point scale of satisfaction from very satisfied to very unsatisfied is at the ordinal level of measurement.

    - At the **interval** level, you can establish the exact distance between categories, but there's no true zero that allows for percentages or ratios. For example, at the interval level, you can say that one person is 3 inches taller than another, but you might not know either person's exact height.

- The **ratio** level can provide that exactitude. Ratio variables do all the things that nominal, ordinal, and interval variables do but also add that true zero so it makes sense to speak in terms of ratios or percentages. Age, salary, and weight can all be expressed as ratio-level variables.

- If you have a nominal variable, you can't calculate a mean; there aren't any numbers to add up. Even if you assign numbers to the categories—for example, single is 1, married is 2, and divorced is 3—a mean of 2.5 means nothing. So, you can't do a mean with nominal or ordinal data. You also can't calculate a median with nominal data. This requires you to put your data in order from highest to lowest, so if you can't rank your data, you can't order it, so that's out, too. All you can do with nominal data is report the modal category.

As a general rule, it is better to gather as precise a set of data as possible. One reason is that you can always collapse variable categories down to something less precise, but you can't do the reverse. If you gather interval or ratio data, you can do all 3 calculations. At the nominal level, you are very restricted with what you can do.

VARIATION

- Variation is about how much variation there is in the data: Are there lots of different values, or do the same values show up a lot? Knowing the middle is important, but not enough.

- Two indicators of variation are the range and the standard deviation.

  - The **range** is the distance between the highest point, or maximum, and lowest point, or minimum, in the data. You calculate it by subtracting the minimum from the maximum. You can also just report it in terms of the minimum and maximum.

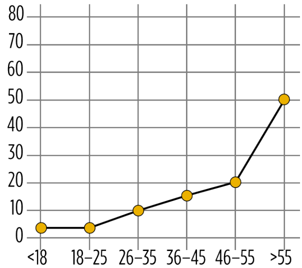
- The **standard deviation** tells you the average distance of the value in your data set from the mean. It's a measure of the overall variation in your variable. It doesn't tell you about the specific distance of a value from the mean, but you get a good sense of the overall picture of the data. Let a statistics program do standard deviation calculations for you.

The more variability there is in a variable, the higher the standard deviation will be.

FREQUENCY

- Frequency is about how frequently each value shows up in the data. Mode tells which category occurs most often, but you may also want to know which values never show up.
- To calculate frequency, you simply count how frequently each value appears in the data. Again, spreadsheet and statistics programs can and should do this for you.
- The problem is how to report this data. Simply reporting the results for every value in the data set is tedious and not very useful. With central tendency and variation, you turn to single statistics; with frequency, you rely on visual depictions.
  - A **frequency table** reports in table form how frequently each value—or, more commonly, range of values—appears in the data. As a rule of thumb, you don't want to report more than 6 or 7 values or it becomes too much data to process. If you have more than 7 or so values in your data set, create value ranges that make sense and then report the frequency on those.
  - A **frequency distribution** is a plotted graph. On the vertical axis, or *y*-axis, you put the frequencies, ranging from the minimum number of times a value is reported—which might be 0—to the maximum, which could be as high as *n*, the total number of data points. This will also be your mode. On the horizontal axis, or *x*-axis, you put

the values themselves from low to high, or a range of values if you have more than 7 or so in your data set. Then, you plot a graph, where each point is at the intersection of the value and the number of times it appears in your data set. This is often reported as a bar chart.

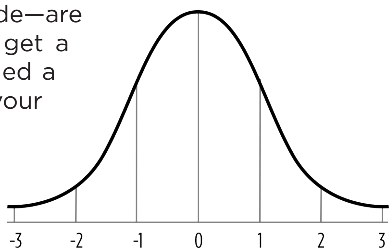


DISTRIBUTIONS AND *Z*-SCORES

- Most word processing programs have features you can use to make visually appealing tables and charts. These graphics are great visual tools to see how frequently different values show up in the data. They give you a **distribution**: a visual depiction of how many times a particular value shows up in your data. Typically, you visualize a distribution using a curved line that connects your data points. That curved line represents your distribution, and everything under the line, between it and the *x*-axis, contains all of your cases.

- By looking at the shape of the distribution, you can see whether the values in the data tend to cluster around the median or are more widely dispersed. You can see whether there is a skew in the data toward lower or higher numbers, which is useful in telling you whether you should use a mean or a median.

- If your measures of central tendency—the mean, median, and mode—are equal to each other, then you get a symmetrical curve typically called a bell curve. When this happens, your distribution, or curve, is normal. A **normal distribution** tells you certain information about a set of data.



NORMAL DISTRIBUTION CURVE

- For example, you know that about 68% of your data points are going to fall within 1 standard deviation of the mean; that is, if you take the mean and add the standard deviation to it, this gives you an upper limit. Then, subtract the standard deviation from the mean to get a lower limit. The area between the upper limit and lower limit, in a normal distribution, will be 68% of your cases. If you add 2 standard deviations above and below the mean, then 95% of your cases will fall between the upper and lower limits. If you add 3 standard deviations, then 99% of your cases will fall between the upper and lower limits.

- Sometimes you will use a **standardized normal distribution**, which is a theoretical distribution where the mean is 0, the standard deviation is 1, and the number of cases is infinite. Through the magic of calculus, the standardized normal distribution can tell you something about ***z*-scores**: calculations that, among other things, allow you to describe your data on multiple variables even if they are expressed in different units.

- A *z*-score expresses the distance of a single case from the mean of the variable. It does so in units of the standard deviation. A *z*-score of 1.5 means that on that variable, the case is 1.5 standard deviations above the mean. A *z*-score of −0.6 means that the case is 0.6 standard deviations below the mean.

- To calculate a *z*-score, all you need is your score or value on the variable for this data point, the mean for the variable, and the standard deviation. The formula to find an individual *z*-score is the score minus the mean divided by the standard deviation.

CALCULATING Z-SCORES

Calculating *z*-scores can be very useful. Using units of standard deviation makes it easy to assess how a case fits into the overall distribution. Just knowing that a case is 2.75 standard deviations above the mean, or 0.75 deviations below it, tells you some interesting information about that case. If the *z*-score is 0, that tells you that its value is the same as the mean—meaning that on that variable, it's an average case. If you are doing case study research and want to select either a typical or deviant case to study, calculating *z*-scores can tell you whether or not a case is typical (close to 0) or deviant (3 or higher).

You can also use *z*-scores to say something about the variable more broadly. If you know a particular *z*-score and use the standardized normal distribution, you can find out how many cases fall between the mean and that score. If you want to do this, grab a normal curve table. These take different forms but typically have 2 columns of information: *z*-scores, and areas between that score and the mean. That second column will tell you what percentage of cases falls between the mean and that particular *z*-score.

Another use of *z*-scores is to look across variables. If you have variables in different units, they can be difficult to compare. By putting all of your variables into units of *z*-scores, you have standardized the scores into something that is easily compared across variables.

READINGS

Abu-Bader, *Using Statistical Methods in Social Science Research with a Complete SPSS Guide*, chs. 3–4.

Geher and Hall, *Straightforward Statistics*, chs. 1–3.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 17.

19

Statistical Inferences from Data

Descriptive statistics can tell you a lot of useful information about your data, but sometimes your research requires you to make inferences about your data that go beyond just describing it. For this, you turn to inferential statistics, which allow you to make inferences from your data—drawing conclusions about it and potentially about the wider population. Some of the more common tests that researchers use to analyze their data are *z*-tests, *t*-tests, and ANOVA.

An understanding of null hypotheses, errors, and statistical significance will help you interpret the implications of your findings, regardless of the tests you run.

NULL HYPOTHESES

- Null hypotheses are statements that no relationship exists between your *x* and *y*. Your null hypothesis becomes specific based on what kind of calculation you are doing. If you are doing tests for correlation, then your null hypothesis stays pretty much the same. For looking at the difference between groups, your null will change to say that there is no difference between the groups you are studying. The key is that it is the null hypothesis you are actually testing, not the hypothesis itself.

- Remember, you are never setting out to prove your ideas—your hypotheses—right. Instead, you set out to disprove. But it is the null hypothesis you are trying to disprove; by rejecting the null, you know that there is something there to capture.

- If you find no difference between means or a relationship between variables, you say that you cannot disprove the null hypothesis or eliminate it from consideration—at least not right now, with your current data and calculations. If you do find a difference or relationship, then you can say that you reject the null hypothesis. That doesn't mean you found the difference or relationship that you were expecting; it just means that something is there.

ERRORS

- It's possible that your sample is not representative of the wider population. With a different sample, you might have gotten different results. That can go 2 ways.
  - It is possible that your analysis of your sample mistakenly tells you to reject the null hypothesis; that is, your sample indicates a relationship or difference exists that in fact does not. This is called a **type I error**; it's a false positive.
  - Alternatively, you might fail to reject the null because your results show no significant relationship or difference. But that relationship or difference might in truth exist, and a different sample would show that. This is a false negative, and it is called a **type II error**.
- A type I or type II error is an issue regardless of the kind of sample method you use. Even with a perfectly drawn random sample, it is still possible to have a type I or II error just by chance.

STATISTICAL SIGNIFICANCE

- Tests of statistical significance tell you how likely it is that your results are due to chance, rather than representing the real value for a population, or due to some kind of error. Estimating statistical significance—frequently represented by *p*-values—will tell you how confident you should be in your results.
- The benchmark in most research is the 0.05 level. This means that there are only 5 chances out of 100 that your results are due to chance. Anything higher than that and your results will generally be considered insignificant. Basically, the risk of a false positive, or type I error, is too high.

Z-TESTS

- *Z*-tests let you see if a sample score is statistically different from a known population score. For your research projects, this is valuable any time you know something about your population of interest and want to see if a particular sample matches that population or deviates in some way.

- To calculate *z*, you need the mean of your sample, the size of your sample (*n*), the mean of the population, and the standard deviation of the population. Use a standard statistics package or spreadsheet program to do the actual calculation.

- A *z*-value tells you the number of standard deviations the sample mean is from the population mean. Remember that about 68% of cases fall within 1 standard deviation from the mean, 95% of cases within 2 standard deviations, and more than 99% within 3 standard deviations.

- *Z*-tests are useful to conduct at the start of your analysis, but there's a limitation: You need to know the standard deviation of your population. If you don't know that, then you'll want to use a *t*-test instead.

T-TESTS

- You can use a *t*-test when you want to know if your sample score is statistically different from your population score but don't know the standard deviation of the population mean. This is called a 1-sample *t*-test, and it's very similar to the *z*-test.

- The main difference from a *z*-test is that you use the standard deviation of the sample, rather than that of the population. Every other calculation is pretty much the same. Once you have your result, you then use a *t*-distribution table to determine the critical value for *t*. This is the value that your *t*-value essentially has to beat to determine statistical significance. If your *t*-value is higher than that listed under your chosen level of significance, then the difference between the 2 means is significant. If not, then it's not. You can find a *t*-distribution table online through a basic internet search.

- *T*-tests are also commonly used any time you want to compare the statistical difference between 2 groups. Descriptive statistics can tell you the average performance of each group on your dependent variable. If you want to know whether or not that difference is statistically meaningful, then you will want to use a *t*-test. This means that any time you are comparing a control group and a treatment group—as in 2-group experimental designs, both those with and without pretests—you will probably want to use a *t*-test. It's also useful if you are comparing programs in evaluation research.

Most statistics models rely on assumptions—things that are assumed to be true about the data. Without those assumptions, the models won't work or will spit back results that simply aren't true.

One reason to run descriptive statistics on your data before the analysis stage is to check some of these assumptions, which might include assumptions that your data are normally distributed or that there is a linear relationship between your variables.

- There are 2 commonly used types of formulas.
  - One is meant for **unpaired** groups—that is, 2 separate groups with separate scores, such as a control group and a treatment group.
  - **Paired** tests are meant for when you are comparing multiple measures from the same group, such as a treatment group that has taken a pre- and posttest.
- You can calculate this by hand, but you are better off using a statistics package that can easily do the *t*-test for you. You just need to know whether you want to use a paired or unpaired test.

- However you make the calculation, you will get a number that is called the *t*-value. This tells you the ratio of the difference between the 2 groups to the difference within those groups. The larger the number, the more the groups are different from each other.

- If, for example, you are working with an unpaired treatment and a control group, then a higher number would mean that there is a larger difference between your treatment and control groups. So, you want to see large *t*-values when you run this test if you hope to disprove your null hypothesis. A smaller *t*-value would instead confirm the null hypothesis.

- The smaller your sample, the larger the *t*-value needs to be. To know specifically how big the *t*-value needs to be for your sample, you have to check it for its statistical significance.

- Most statistics programs will tell you the statistical significance of your *t*-value when you do the calculation. This takes the form of a *p*-value. You will look for the *p*-value in your statistical output, and you want to see that it is less than 0.05—the standard level of significance. A *p*-value of 0.05 means that there is no more than 5% likelihood that your results are due to chance. That means there is a 95% likelihood that your results are real. You can also use a standard significance table online or in the back of any statistics textbook once you have your *t*-value.

- In practice, if you were comparing a treatment and a control group, this means that any difference you found in the posttest means between those 2 groups is probably real. That would indicate you could reject the null hypothesis.

- However, this does not mean that you have proven your hypothesis correct. There is still a 5% chance that your results are due to chance, so you can't be 100% certain that you've got it right. You've definitely got something—evidence in favor of a likely difference. But don't overstate your claims. Also, if there are any internal validity issues with your study, these may account for your results. That's why you account for these possibilities when discussing your results.

- Quantitative analysis lets you state specifically how likely it is that your findings are valid. That leaves room for exceptions, nuance, and restrictions—and it means that you are being honest about the scope of your claims. That allows other researchers to build on what you've found and over time will increase confidence in the breadth and scope of your answers.
- When you remember that your work is part of a larger story and that any findings move you forward in the narrative, it's easier to accept the limitations of what you can say about your claims.
- And it's dangerous to do otherwise. Already, research is bent and shifted and manipulated to fit the stories that others want to tell.

If you look at a critical values table, you will often see different values for a 1-tailed test and a 2-tailed test. Which you use depends on whether or not you expect the difference between your groups to occur in a particular direction.

- If your hypothesis expects to find that one group will have a higher mean than another, then you are going to work with a 1-tailed test. That means that you expect any extreme values to occur solely on one side of the distribution.
- A 2-tailed test indicates that you are testing for a difference but don't know if it will occur at the high end or the low end of the distribution; your hypothesis expects only to find a difference but does not indicate the direction of that difference.

Most of the time, you are probably going to use a 2-tailed test, but you might use a 1-tailed test under certain circumstances.

- The defense you have against this is to point back to the original work and note the restrictions and conditions. There is an honesty there that you can use to fight back against any manipulations of your findings. But if you participate in that manipulation from the beginning, then you are no longer in the business of finding answers; you are back on the quest to prove yourself right. And that's not good research.

ANOVA

- Analysis of variance, or ANOVA, is useful for experiments and survey research. Like a *t*-test, ANOVA lets you compare differences between groups to test for statistical significance. In fact, a 1-way ANOVA test is functionally equivalent to a *t*-test, although it looks at differences in variance rather than means.
    - The 1-way ANOVA test works with only 1 independent variable with 2 values—which are referred to as levels.
    - The 2-way ANOVA test lets you examine 2 independent variables, each of which can have multiple levels.
- The ANOVA test lets you do statistical analysis when your independent variables are at the nominal and ordinal levels of measurement and your dependent variable is at the interval or ratio level. If you are working with variables such as gender, race, marital status, or other traditional categorical variables and want to compare group differences, the ANOVA test may be a good choice for you—particularly if you have more than 2 or 3 independent variables.
- When you run an ANOVA test in your statistics program, you will get the *f*-value for each variable as well as the interaction between each pair of variables. The *f*-value is similar to the *t*-value from the *t*-test, but the *t*-test only tells you about the differences in a single independent variable, while the *f*-test gives you information about more than one variable at a time.

- To interpret your results, you have to do 2 things.
  - You need to find the critical value of *f* using a table. This will give you a benchmark to judge your results. If your *f*-value is less than the critical value in the table, then you should accept the null hypothesis. Only if the *f*-value is greater than the critical value can you consider rejecting the null hypothesis and move forward.

In the *f*-table, you will have 2 sets of degrees of freedom, which is the number of independent pieces of information in your calculation of your estimate. Degrees of freedom is basically the number of pieces of information minus the number of estimated parameters, which is often 1. Frequently, your "pieces of information" is your number of cases, or *n*, so many times your calculation of degrees of freedom would simply be *n* − 1.

For the *f*-table, you will need 2 different degrees of freedom: one for the numerator and one for the denominator. The numerator is the degrees of freedom for the number of categories in your variable, and the denominator is the degrees of freedom for the number of cases in the variable. If you look for the number at the intersection of those 2 degrees of freedom, this will give you your critical value. You want your calculated *f*-value to be higher than this critical value.

\	df 1=1	2	3	4	5	6	7	8	9	10	...	∞
df 2=1	39.86346	49.50000	53.59324	55.83296	57.24008	58.20442	58.90595	59.43898	59.85759	60.19498		63.32812
2	8.52632	9.00000	9.16179	9.24342	9.29263	9.32553	9.34908	9.36677	9.38054	9.39157		9.49122
3	5.53832	5.46238	5.39077	5.34264	5.30916	5.28473	5.26619	5.25167	5.24000	5.23041		5.13370
4	4.54477	4.32456	4.19086	4.10725	4.05058	4.00975	3.97897	3.95494	3.93567	3.91988		3.76073
5	4.06042	3.77972	3.61948	3.52020	3.45298	3.40451	3.36790	3.33928	3.31628	3.29740		3.10500
6	3.77595	3.46330	3.28876	3.18076	3.10751	3.05455	3.01446	2.98304	2.95774	2.93693		2.72216
7	3.58943	3.25744	3.07407	2.96053	2.88334	2.82739	2.78493	2.75158	2.72468	2.70251		2.47079
8	3.45792	3.11312	2.92380	2.80643	2.72645	2.66833	2.62413	2.58935	2.56124	2.53804		2.29257
9	3.36030	3.00645	2.81286	2.69268	2.61061	2.55086	2.50531	2.46941	2.44034	2.41632		2.15923
10	3.28502	2.92447	2.72767	2.60534	2.52164	2.46058	2.41397	2.37715	2.34731	2.32260		2.05542
...												

- If your results pass this test, you have to see if they are statistically significant. Look at the *p*-value—the likelihood that your results are due to chance—that your statistics program gives you after doing the test. You usually want this to be 5% or less. If your *f*-value is higher than the critical value from the table and has a *p*-value of 0.05 or lower, then you can probably reject the null hypothesis—you've found a difference between groups. If your *p*-value is above 0.05, you cannot reject the null hypothesis—even if your *f*-value was higher than the critical value. In such cases, you cannot say that there is a significant difference between your groups, even if the difference in numerical terms appears large.

- There are variations on ANOVA based on how many variables are involved and whether or not you are comparing 2 completely different groups or the same group over time. Your statistics program should have these options available to you.

Keep in mind what you learned about type I and type II errors.

You may reject your null hypothesis because you found that your *f*-value was high enough and was statistically significant. But even if this is true, it's still possible that you made a type I error and that you have mistakenly rejected the null hypothesis.

While you can't be sure that you've avoided a type I error, you can estimate how likely it happened—thanks to calculating statistical significance.

READINGS

Abu-Bader, *Using Statistical Methods in Social Science Research with a Complete SPSS Guide*, chs. 8–10.

Geher and Hall, *Straightforward Statistics*, chs. 6–12.

Krathwohl, *Methods of Educational and Social Science Research*, ch. 19.

20

Assessing Correlation and Causation

When analyzing the relationship of one variable to another, you must consider the differences between correlation and causation. Correlation refers to the idea that 2 or more variables are related to or associated with each other—as one changes in value, the other does, too. Causation is the idea that the change in value in one variable causes the change in another variable. This is a stronger statement than correlation. With correlation, it might just be a coincidence that 2 variables seem to change values concurrently, or you might not be able to pinpoint which variable is causing the change in the other. With causation, you are claiming that changing one variable causes the other to change as well.

CORRELATION VERSUS CAUSATION

- Correlation is necessary but not sufficient to establish causality: You need to find a correlation as one step on the path to show a causal relationship between 2 variables, but just finding that correlation is not enough to say that change in one variable causes change in another.

- There are 4 requirements to establish a causal relationship between 2 variables.

  - **Establish a correlation between the 2 variables.** This means that as you see change in the presence or value of one variable, you also see a change in the presence of value of a second variable. But just because you establish correlation does not mean that you have causation.

  - **Establish a theoretical relationship between the 2 variables.** One way to know if your correlation is a simple coincidence or not is to have a strong explanation for why the 2 variables might be related. Does it make sense that one variable causes the other?

It's a logical fallacy to assume that just because you find a correlation you've established causation. Just because 2 things happen at the same time or in sequence does not mean that one causes the other.

- **Establish temporal order between the 2 variables.** This is a formal way of saying that if you are going to claim that some variable *x* causes change in some variable *y*, you have to be able to show that *x* occurred prior in time to *y*. This is simple in theory but can be difficult to do in practice. If you don't have the information to establish temporal order, establishing causation beyond any doubt will be difficult. But just because you establish that one variable occurs prior in time to another, it does not mean that the first one causes the change in the second one.

- **Eliminate alternative spurious explanations for the relationship between 2 variables.** This means that you need to make sure there is no third variable that is actually driving the correlation between *x* and *y*. It is possible that the correlation between *x* and *y* is actually caused by some third variable—for example, *z*. When you have a spurious cause, what is really going on is that *z* is changing, and *z*'s change is causing the change in both *x* and *y*, rather than *x* causing the change in *y*.

There is a statistical finding that as ice cream sales (*x*) rise, so does violent crime (*y*)—and vice versa. Is there some third variable (*z*) that might explain why ice cream sales and violent crime seem to rise and fall at similar times?

Both ice cream sales and violent crime are likely to increase in the summer, when it's warm out. In this case, temperature (*z*) is driving the change in both ice cream sales (*x*) and violent crime (*y*).

In other words, *x* and *y* are correlated, but *x* is not causing *y*.

- Establishing correlation is just one of 4 things you have to do to establish causation. It is much easier to show that correlation exists between 2 variables than that causation does.

- When evaluating whether or not your variables are related to each other—correlated—there are typically 2 broad outcomes.

    - **There is no relationship.** No matter how you change one variable, there is no apparent effect on the other. This outcome supports the null hypothesis and casts doubt on your hypothesis.

    - **There is a relationship.** It might be weak or strong or only exist under certain conditions. It might be positive or negative or curvilinear. You cannot reject the null hypothesis.

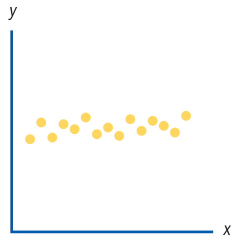
One way to eliminate spurious explanations is to hold all variables other than your independent variable constant. If you know that the only variation in your study is that of the independent variable you think is relevant, then that gives you more evidence that *x*, rather than *z* or some other variable, is driving any perceived change in *y*. Statistical software can do this for you.

- Once you have data, you have several tools to evaluate whether or not a relationship exists between 2 variables, as well as the strength, direction, and precision of any relationships that do exist. Two such methods are examining scatterplots and calculating the correlation coefficient.

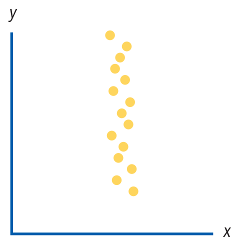
SCATTERPLOTS

- A scatterplot is a graphical depiction of data where you plot data points on an *x*-*y* axis. For each case in your study, you plot its value for *x* on the *x*-axis and its value for *y* on the *y*-axis. You can do this by hand or have software do this for you. Once you have all of your data plotted, you get a visual representation of the relationship between the 2 variables. By examining that image, you can figure out a few things—such as whether a relationship exists as well as the form, direction, and strength of a relationship.

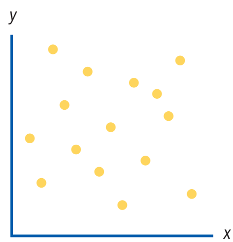
- If your graph looks like a narrow horizontal line of points in the center—all of the data points are on a single value of *y* while the *x* points vary widely—then there is no relationship between *x* and *y*. Because *x* is changing a lot but *y* isn't moving, this means that a change in *x* does not correspond to a change in *y*. If your graph looks like this, you can safely say that your data indicates no correlation between the 2 variables and that the null hypothesis is supported.



A relationship—a correlation—means that changing the value of *x* coincides with a change in the value of *y*.

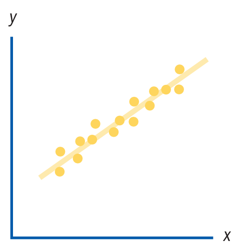


- If your graph looks like a narrow vertical line, this would also be true. The graph tells you that for any given value of *x*, *y* is changing dramatically—meaning that it is not *x*, but some other variable, that is causing the change in *y*.



- And if your graph looks like a completely random set of points with no discernible pattern, you would again be pretty confident in claiming no relationship exists between *x* and *y*.

- But if you graph your points and see a pattern—for example, you could draw a straight line through your points diagonally up from the bottom left of your graph where the 2 axes meet up to the top right—then that would tell you that as the values of *x* increase (as points move to the right), *y* is also increasing (the points move up). This would indicate that a relationship exists.



- This is called a **positive, or direct, relationship**: An increase in *x* correlates with an increase in *y*, and a decrease in *x* correlates to a decrease in *y*. Both variables are moving in the same direction together.
- If instead the line starts in the upper left and goes diagonally down to the bottom right, you would also have a relationship, but it would be a **negative, or inverse, relationship**. As *x* increases, *y* decreases—and vice versa.

There are limits to the use of positive and negative relationships when it comes to hypothesis writing. You need to have data at least at the ordinal level of measurement for this approach to make sense.

Remember, at the ordinal level, there is some sense of being able to place measures in ranking order. If you can't at least rank your variable values or put numbers on them, then the idea of positive and negative relationships doesn't make sense—and a traditional scatterplot won't be particularly useful.

- In addition to using a scatterplot to determine the existence and direction of a relationship in the plot, you can say something about the form and precision of the plot. Positive and negative relationships are both **linear** relationships; they are straight lines from one point to another. There are other forms, such as curvilinear relationships, in which *x* and *y* might have one direction in some ranges of their values and then change to another in later values. This could result in a C shape, a U shape, or a curved-r shape.
- The final piece of information you get from a scatterplot is about the precision, or strength, of the relationship. If the dots from your graphed data are very close together, that indicates that the relationship is pretty strong. If they are farther apart and it's harder to see a pattern, then the relationship is weaker.

CORRELATION COEFFICIENTS

- The statistical calculation of the correlation coefficient can give you much better answers about the strength of a linear correlation than a scatterplot—while also telling you whether one exists at all and the direction of the relationship.

- The correlation coefficient, also called Pearson's *r*, is a way of testing to see whether a linear relationship exists and, if so, how strong it is. Pearson's *r* will analyze your data on 2 variables and calculate a number between 1 and −1, where 1 indicates a perfect positive linear correlation between your 2 variables, −1 indicates a perfect negative linear correlation between the variables, and 0 indicates no relationship at all.

Karl Pearson was one of the fathers of statistics, writing in the late 19th and early 20th centuries.

- If you look at the absolute value of *r*—ignoring the positive or negative signs—you can tell a lot about the strength of the correlation. A 1 or −1 would be a very strong relationship (a perfect correlation), and a 0 would be a nonexisting relationship. Anything between 0 and 0.4, on either side, would typically be considered a pretty weak correlation. Between 0.4 and 0.8 would be a weak to strong relationship, while anything between 0.8 and 1 would be very strong.

- If you really want to say something about the strength of the relationship, square the value of *r*—that is, multiply it by itself. This is called *r*-squared (r^2), and it tells you how much of the variation in *y* is explained by your *x*. It is reported as a percentage.

- All statistical programs will be able to calculate *r* and r^2 for you. In a typical spreadsheet program, simply select the 2 variables of interest and use the formula for the correlation coefficient. That will give you the value of *r*. If you square that number, you will then get r^2.

- You need to see if your correlation coefficient withstands a test of significance. This will tell you whether you can be confident that your results are due not to chance, but to a real finding that can be applied to your population, not just your sample.
- You can consult a critical values table to tell you whether or not your value for *r* is significant and therefore applicable to the population. This will tell you the critical value of *r* needed to determine statistical significance at the 0.05 level or better. Or you can let a statistics program do this for you and tell you whether or not your correlation is statistically significant.
- Typically, the more cases you have, the lower your correlation coefficient has to be to ensure statistical significance. With a large data set, even a small coefficient can mean significant results. With a small *n*, however, you will need a much larger coefficient to have a significant finding. Basing your findings on a handful of cases means that the correlation needs to be pretty much perfect to have any sense of confidence in your findings. But a large data set requires a much lower threshold.

> Finding the correlation coefficient is not enough if you want to tout your results; you need to see if it reaches the 0.05 benchmark for statistical significance.

READINGS

Abu-Bader, *Using Statistical Methods in Social Science Research with a Complete SPSS Guide*, ch. 7.

Geher and Hall, *Straightforward Statistics*, ch. 4.

21

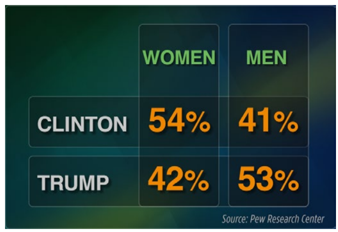
From Bivariate to Multivariate Analysis

For most of the quantitative analysis techniques you've learned about, at least one of your variables—usually the dependent variable—had to be on an interval or ratio scale. But if you have data at the nominal or ordinal level, there are still ways of quantitatively analyzing it. One way is to create a contingency, cross-tabulation, table. For nominal data, you can then calculate a chi-squared value, which tells you the level of association between 2 nominal variables.

Regardless of whether you need to calculate chi-squared, a cross-tabulation table can be a useful step in evaluating whether a relationship exists in your data.

CROSS-TABULATION TABLES

- Cross-tabulation tables let you visually examine the relationships between 2 variables.
- For example, in the 2016 US presidential election, the Pew Research Center reported that 54% of women and 41% of men voted for Hillary Clinton and that 42% of women and 53% of men voted for Donald Trump. This is the kind of information you get from a cross-tabulation table.



- There are 2 variables: vote choice (with the possible values of Clinton and Trump) and voter gender (reported as man or woman). A cross-tabulation table takes these 2 variables and reports the number of people that fall into each of the cross categories—in this case, female Clinton voters, female Trump voters, male Clinton voters, and male Trump voters.
- The full table might also include additional categories for male and female voters for other candidates in the election, which is why the percentages don't add up to 100 in this case. When reporting the data, you can do this in multiple forms: as a contingency table, as a graph, or just by reporting the numbers themselves.

- Making a cross-tabulation table is quite easy. It's all a matter of observed frequencies. A frequency is simply the number of times a particular value on a variable appears in the data. For a cross-tabulation table, you look at frequency for 2 or more variables at a time, pairing up the number of cases where your variables have a value of interest.

- In this example, there are 4 possible categories: woman Clinton voter, woman Trump voter, man Clinton voter, man Trump voter. Then, you count the number of times a case has both the value of "woman" for gender and "voted for Clinton" and repeat for the other 3 possible categories. That would give you the raw count: the total number of cases falling into each of the 4 categories. From there, you can calculate percentages to see what percent of women and men voted for Clinton versus Trump. All of this information goes into a table.

- Any spreadsheet program will let you calculate these frequencies fairly easily, but most statistics programs allow you to just pick your variables of interest and they will generate a cross-tabulation table for you instantly.

Due to the ease of creating and interpreting cross-tabulation tables, this is a very typical analysis that is done in research. Survey research in particular can benefit from this, as cross-tabulation tables can quickly show you through a visual medium whether there are patterns within variables.

CHI-SQUARED TESTS

- A chi-squared test lets you take the data from a cross-tabulation table and tells you how likely it is that any pattern or relationship you observe is real and not due to chance. Generally, researchers agree that a 0.05 level of significance is an acceptable threshold—meaning that only 5 times out of 100 your results are due to chance and not due to a real finding. This means that 95% of the time, your findings are an accurate picture of the true population.

- A chi-squared test lets you perform this important function even though your data is not at the interval or ratio level. When your variables are categorical, chi-squared is the way to go.

- Consider the 2016 presidential election. You might say that the gender of the voter mattered in terms of vote choice. The gap was 11 points between male and female voters for Trump. But is that difference a real difference or one due to chance? Chi-squared can help answer that question.

- A statistics program can calculate chi-squared for you. Once you know the chi-squared value—which, in this example, is 36.8—you have to consult your table of critical values for chi-squared to see if your result exceeds the critical value needed for the 0.05 level of statistical significance. It turns out that a chi-squared value of only 3.84 is needed to exceed the critical value for this election data.

- As a result, you can be reasonably confident that these results are not due to chance—and therefore reject a null hypothesis of no relationship between gender and vote choice in the 2016 presidential election. Keep in mind, though, that chi-squared doesn't tell you anything about the strength of any association between these 2 variables, just that one is likely to exist.

LINEAR REGRESSION

- Regression allows you to apply statistical controls to your data to test for the independent effect of each *x* on your *y*. It doesn't completely eliminate the risk of alternative explanations; if a variable isn't included in your data set, you can't necessarily control for it. But regression can tell you the extent to which your independent variables capture change in the dependent variable, and this means that, more than any of the other techniques you've learned, this one is the best able to help you say something not only about differences and correlation, but about causation. If your project asks questions about whether one factor or variable causes another, regression might be your ticket to an answer.

As with all statistical tests, linear regression rests on certain assumptions. Before using regression, you will want to make sure that your data meets these assumptions.

- **Linear data**. You expect to find a relationship that is either positive, where increases in *x* lead to corresponding increases in *y*, or negative, where increases in *x* lead to decreases in *y*. If you instead expect to find a curvilinear or other kind of relationship, the standard regression analysis is not going to work very well.
- **Normal distributions of all variables**. There are tests you can run for this, but one thing to watch out for is if your data has outliers that might skew an otherwise normal distribution. You can check this by creating a quick graph of each variable or by standardizing your variables into *z*-scores.
- **Homoscedasticity**. This means that the variance of the errors is stable regardless of the value of *x*. You don't want the errors to be higher for some values of *x* than others. You can check this by graphing the errors after running a regression and seeing if they are pretty evenly distributed everywhere along the line. There are also tests you can run to check for this, but a visual inspection will give you your first hints if you have a problem here.
- **No multicollinearity**. Regression assumes that your independent variables are not highly correlated with each other. Otherwise, the model gets confused over their independent causal power.

There are several other assumptions that linear regression relies on, but these should give you a good start on deciding whether or not your data is appropriate for regression.

- The equation for regression is $y = \alpha + \beta x$, where y is the predicted value of the dependent variable. This means that y is a function of alpha (α), which is the constant or intercept, as well as a coefficient beta (β) and a given value of x.

Regression
$y = \alpha + \beta x$

- This translates directly to a plotted graph, which has an x axis and a y axis. You can plot your graph using the x and y values for each case in your data and then draw a line that minimizes the squared distance between points. The intercept point—the point at which your line crosses the y axis, is α, and the slope is β, so to find a given value of y, you simply need to know your starting point, your slope, and your value of x.

- You can take all the dots that represent pairings of x's and y's and draw a line that shows the strength of the relationship. That line is the regression line—and the equation gives you that line.

Regression is not something you want to calculate by hand; let your favorite statistics package do it for you.

- When you run a regression, you are going to feed in your data and indicate the variables serving as your y and x. If you are running an analysis with one x, that's called bivariate regression. If you have multiple x's, it's called multivariate regression. Either way, you are going to get a bunch of useful information as outputs, including r-squared, betas, standard errors, and p-values.

    - ***R*-squared** tells you how much of the variation in y is captured by variation in the other variables. It's read as a percentage. R-squared tells you something about the overall strength of your model—that combination of x's you've used to try to explain the variation in y.

- You also get valuable information about each individual variable when you run a regression. Most important are your **betas**—the coefficients that tell you the exact predicted impact of *x* on *y*. They tell you that for every 1 unit increase in *x*, this will be the corresponding increase in *y*. The unit is in standard deviations. The size of the beta tells you the size of the impact of that *x* on *y*. A small beta means that *x* only has a small influence on *y*. A zero would support the null hypothesis, that there is no relationship between *x* and *y*. Larger betas mean that *x* has a larger effect on *y*—and that is ultimately what you are testing for.

On a graph, the beta is the slope of the line. A larger beta means a steeper slope and therefore a greater impact. A lower beta indicates a less steep slope and a weaker effect. You want to see large betas in your results.

- Your results will also give you a **standard error of the estimate** and **standard errors for each coefficient**. The standard error of the estimate is a measure of how much on average each actual data point differs from the predicted point on the regression line. In essence, this is a standard deviation of the error. The standard error for each coefficient is the standard deviation of that particular coefficient. You generally want your betas to be large relative to their standard errors—a sign of the power of that independent variable in affecting the dependent variable.

- Your output will also typically give you your *t*-statistic and its associated ***p*-value** for each variable—this is a measure of the statistical significance of your variable. Remember, no matter how big your beta is, if the variable is not statistically significant at the 0.05 level or better, it should not be reported as a genuine finding. You should also get a *p*-value for the entire model; you'll want to make sure that it, too, is at the 0.05 level or better.

Regression provides a prediction of a value of *y* based on a given value of *x*. This means that if you know a given value of *x*, based on the data you've analyzed, you can predict the value of *y*. This is what you want when it comes to causality: You want to be able to say that a given value on the independent variable is likely to have some kind of impact on the dependent variable.

Just be careful in how you interpret these results; there are a number of fallacies to watch out for.

- The **ecological fallacy** occurs when you assume that your statistical results for a sample or group can be applied to an individual.
- The **reductionist fallacy** occurs when you assume that, upon finding a relationship between *x* and *y* or seeing that *x* occurs prior to *y*, that *x* is the single cause of change in *y*. There may in fact be multiple variables that are affecting *y*.

There are many other logical fallacies that you can make, so always think through exactly what your results are telling you so that you can report them accurately and with context.

- Multiple regression is an extension of regression. Instead of one independent variable, it uses multiple independent variables. The equation accounts for this:

  $$y = a + b_1x_1 + b_2x_2 + ...$$

- Using multiple regression, you can calculate a coefficient for each *x* in your equation.

- Including additional variables in your analysis can allow you to test more complex models of causality. It lets you consider the idea that more than one *x* plays a role in affecting *y*. Building a model often involves considering multiple variables, so that often means you may want to run multiple regressions that use all of these variables. Just keep in mind that you want your independent variables to be independent of each other; you don't want your *x*'s to also be too highly correlated with each other.

- Multiple regression will still give you an *r*-squared for the overall model so that you can see whether including those additional variables accounts for more of the change in *y*. You will probably want to use the adjusted *r*-squared, which accounts for your addition of such variables.
- Your results will also give you beta coefficients for each variable, which will show you the impact of each variable. Sometimes by including additional variables, you'll find that an *x* that previously had a high statistically significant coefficient no longer does—a sign that your new variable might have more predictive power than the previous one.

READINGS

Abu-Bader, *Using Statistical Methods in Social Science Research with a Complete SPSS Guide*, chs. 11–12.

Geher and Hall, *Straightforward Statistics*, chs. 5 and 13.

22

Foundations of Qualitative Analysis

Qualitative analysis usually involves identifying patterns and meaning in texts, from books and other forms of writing to videos and conversations—basically, information that is not necessarily easily transformed into numbers and therefore not readily subject to statistical analysis. The uses of qualitative analysis can be widespread. Importantly, while qualitative work may play around with the structure of the scientific method more than quantitative analysis, at its core qualitative analysis requires the same systematic approach of all research. You still have to outline a set of procedures you will follow, justify their use, and follow them in a transparent way.

QUALITATIVE VERSUS QUANTITATIVE ANALYSIS

- There are several broad differences between qualitative and quantitative analysis.
  - Qualitative research tends to follow a much less linear path than quantitative work. This is particularly true when it comes to data collection and data analysis. With quantitative work, collection typically comes before analysis. But in qualitative research, you often analyze data as you collect it—and then go back and get more data as the analysis continues.
  - In quantitative approaches, you typically determine a sample in the design stage of the research. You draw a sample—maybe a random sample—from a population and collect data on it. Or you say at the outset that you want a certain number of participants for an experiment and recruit subjects until you reach that number. In qualitative work, you often don't know at the start how many subjects you will have or how much data you will need. Instead, you continue to collect data until you reach saturation—the point at which collecting additional data provides no new insights or added value.

As compared to deductive approaches, the benefit of inductive approaches is that you are less likely to go into data analysis looking for evidence to confirm your preexisting ideas. But it also means that you can be more susceptible to data fitting and letting the initial part of the analysis overly influence your thinking.

As with all research, there are trade-offs on all approaches; no single approach is wholly good or wholly bad.

- Qualitative analysis lends itself not only to deductive work but also to inductive work. You can certainly start a deductive process of generating theories and codes based on your literature review and then testing them against the data you gather. But qualitative work frequently mixes in more inductive approaches, where you start with the data and see what patterns and themes emerge before building your theory. Many qualitative researchers use both methods at the same time—using both theory and initial assessment of the data to drive coding and theme building.

- Qualitative work tends to be much more open to interpretivist perspectives than quantitative work, which is typically overwhelmingly positivist in orientation. Because cases aren't boiled down to a series of numbers in qualitative work, there is much more freedom for interpretivist approaches.

Recall that positivists tend to assume there is a single, objective truth that can be uncovered through data collection and analysis, while interpretivists point out that truth is multiple and subjective.

- There are advantages of using qualitative analyses over quantitative approaches—as well as drawbacks.

  - While quantitative approaches let you gather data on many variables and cases, typically qualitative research focuses on going in depth on a few variables in a few cases to really understand and explain them. This can be great, but it has a drawback: There can be the problem of too many variables and too few cases.

A lot of qualitative work is not interested in causality, but if causal processes are important to your work, then keep in mind the challenges of generalizing from your results to a larger population. You simply don't know if your case is representative of a wider pattern, so you'll need to either combine your work with findings from research on other cases or limit your claims.

- The openness to interpretation in qualitative work lets you really engage in interpretive work, allowing the researcher—either alone or in collaboration with his or her subjects—to tell complex narratives and identify interesting patterns and themes. But the role of the researcher as an interpreter of information runs some risk of allowing preexisting biases to enter the process.

- There are risks in quantitative work, but the risk tends to be that someone makes a conscious choice to aim for a certain set of results. That's a risk in qualitative work, too—anyone can make up data or results—but there are other, more subconscious risks that tend to be more prevalent in qualitative work. Because qualitative work tends to mix the collection and analysis of data, some cognitive biases can have a bigger impact than in other forms of analysis. You need to watch out for these.

- Another issue is the anecdotal fallacy, where you read more meaning into an individual experience or particular example than you should. You should never extrapolate from a single, probably unrepresentative example. Yet it is human nature to focus on examples and be overly influenced by them. You have to watch out for this and other logical fallacies in qualitative research. This is very similar to the issue of your own experience not necessarily being representative of a wider group or phenomenon.

- In qualitative work, outlier or extreme cases need to be assessed thoroughly and not ignored or simply removed from the data set. Thorough assessment can provide greater insight into the nuances of what is going on. Sometimes studying an outlier can isolate a variable that you otherwise might not identify as important. But at the same time, you don't know at the start whether a case is an outlier or representative, and you shouldn't make any assumptions until you've evaluated enough data to really know.

- When it comes to analyzing data, confirmation bias can be a tricky problem. You are more likely to accept data that agree with your preexisting beliefs and ignore or discredit data that challenge them. Confirmation bias can be a particular problem with qualitative analysis midway through the process as your ideas have already begun to take form. As you move on to the next set of data, you have to be open to the idea that your initial impressions are not correct.

WHEN TO USE QUALITATIVE METHODS OF ANALYSIS

- You should consider using qualitative analysis when
  - the large-scale data you want is unavailable;
  - you are interested in the complexity and context surrounding some phenomenon;
  - the stories and experiences of your individual subjects are central to your research and those stories and experiences cannot be readily aggregated into means, medians, and modes;
  - you have a small number of subjects or cases;
  - you want to focus on descriptive research; and
  - you are studying communication.

> If you are studying a small number of cases or subjects and want to dig into the description, depth, complexity, and context of those cases, then qualitative analysis may be right for you.

- Which method of qualitative analysis you use can depend on your type of data and the purpose of your research.

- If you choose any method of qualitative analysis, you will want to consider using computer software to help you. With qualitative data, you may only have a small number of cases, but you might end up with a massive amount of data on each case.

- Most methods of analysis call for sorting through data, coding it, writing memos, and assessing your codes and memos for patterns and themes. There's a variety of qualitative data analysis software that can make it easy to search through text, apply codes, and tag data with comments and memos. It will keep your data organized for you as well. A word processing program can do most of this, but some of the specialized software that exists, such as NVivo, can do much more, such as code for you. As with quantitative analysis, these products will require some training, but you will quickly realize the value of using them if you have anything but the smallest amount of data to code.

With qualitative data analysis software, you can see the results of your codes and even generate tables and charts based on them—but the interpretation is more fluid, as compared with quantitative software, with a greater role for the researcher's understanding of the results.

A BASIC APPROACH TO QUALITATIVE ANALYSIS

- The following is an overall, basic approach to qualitative analysis. It is certainly not the only way to do qualitative work, but you may find it useful as you are just starting out in your qualitative research. This basic approach involves taking your qualitative data, coding it for concepts and categories of interest, writing memos that will serve as a record of your observations, and identifying relevant patterns, themes, phenomena, stories, or classifications. The variation will come in the kinds of data you use; the type, nature, and frequency of coding; and the overall goal of the analysis. You can do this deductively—where your coding choices are informed by theory—or inductively, where in the process of coding and interpretation you develop your theory. This general approach is therefore quite flexible in how you adapt it to your specific project.

- The first step is to gather your initial data. This might be transcripts of interviews or conversations or various written texts and records.

- Then, you will need to start coding this data—by the word, phrase, sentence, paragraph, chapter, etc. Focus your coding on categories that are relevant to your research question, problem, or area of study, but be very open in what these codes might be. Codes might focus on topics, events, people, behaviors, attitudes, beliefs, relationships, experiences, emotions, goals, or linguistic choices. You can have software do this for you or you can track your own work.

- While you are coding the data, you should regularly write memos. These are comments—short or long—that provide your interpretation of the data as you go along. These memos are not meant for anyone other than you; they can be in stream-of-consciousness form if you like. The goal is to record any and all thoughts you have about the data as soon as possible after you have those thoughts. It is in the memos that you will start making connections, generating theories, and seeing patterns. You then engage in an ongoing back-and-forth process: As you code and write memos, you may come up with new categories and subcategories that you didn't see at the beginning. You may realize that more data is needed, so you go out and get more data and then code it. You may engage in new rounds of coding, where you create broader categorizations of codes that capture the meaning of several of your initial codes. You continue to do this until you reach the saturation point, where you

> Your interpretation as a researcher is very important to the qualitative analysis process.

aren't seeing new categories to consider and where collecting more data is not likely to lead to any new revelations or understandings.

- As you examine your coded data and memos, you will start to note patterns and themes. There are many ways to do this, depending on the nature of your question and your discipline, but the same kind of goals you've considered throughout this course can still apply. You can look for connections between variables, just as you would with quantitative data. Diagramming your ideas can also help. You can do this as part of the memo process or closer to the end as your ideas really start to develop.

READINGS

Edmonds and Kennedy, *An Applied Guide to Research Designs: Quantitative, Qualitative, and Mixed Methods*, ch. 11.

Walliman, *Social Research Methods*, ch. 12.

23

Qualitative Analysis Variations

Grounded theory is closely related to the basic approach to qualitative analysis, but it provides a more specific purpose and format. In general, grounded theory is an inductive process of generating a theory grounded in the data you have collected. Unlike most of the research you've been exposed to thus far, it's pretty explicit in grounded theory that you should not start with a theory—the goal of the approach is to develop a theory rather than to test one. In fact, in grounded theory, you might even postpone conducting a literature review and not do one at the start to preserve the inductive process. You do conduct a literature review eventually, but you do it later, after you've already independently developed the first ideas of your theory. In some cases, grounded theory may even ignore the rule that you start with a research question or problem; you might work with just a general phenomenon of interest.

The basic approach to qualitative analysis—outlined in the previous lecture—focuses on coding, memos, and interpretation. You collect your initial data, build a set of categories that represents potential points of interest or interpretations of that data, and start coding the data according to those categories. You write memos noting your interpretations and insights of the data. As you go through the process, you will add more categories and seek more data until you reach the saturation point, where additional data doesn't add much to your analysis. You then review your categories and memos for higher levels of meaning, patterns, themes, or points of interest

GROUNDED THEORY

- The practice of grounded theory is pretty structured. It can be done by a single researcher or as part of a team, where multiple people engage in regular consultation during the coding process. As with the basic model, you can engage in triangulation, using several sources of data to see if your findings apply more broadly. You will also engage in the comingling of data collection and analysis, with the analysis informing future choices regarding data collection.

According to one of its principal founders, Barney Glaser, "grounded theory is the study of a concept." The goal is to find the core concept that is embedded in the data that can have broader implications beyond simply describing what is in the data.

- You probably should still start with a question about your phenomenon of interest. But your question may broaden or narrow as you go through the grounded theory process, so you should be open to changing even your question as you engage with your data.

- Once you have your question sorted, you should start collecting data. This data can come from a variety of sources, such as records, interviews, fieldwork, or focus groups; it depends entirely on your study and what you have available. You don't need all of your data to start—just enough to start coding and thinking through categories. But if you like, or if practical reasons demand it, you can do all of your data collection before you start coding.

- Once you have at least an initial set of data, it is time to start coding. Remember, you don't wait to have all your data; you start the analysis right away. In grounded theory, there are 3 stages of coding: open coding, axial (or theoretical) coding, and selective coding.

    - In **open coding**, you aren't typically starting with a theory to inform your coding decisions, so you might not have a preset set of codes going in when you start coding. Instead, the codes will evolve throughout the open-coding process. In open coding, you identify all possible concepts or interpretations found in the texts you are studying. Throughout the coding process, you write stream-of-consciousness comments and memos to yourself that outline your ideas, possible concepts, connections, hierarchies, and relationships.

- In **axial coding**, you start considering relationships between the codes you developed in open coding by identifying categories. You compare categories for similarities and differences, develop subcategories, link categories together, and consider data that doesn't fit neatly into these categories.

- In **selective coding**, you integrate the categories from axial coding to identify the core category and the fundamental phenomenon represented by the data, as well as how it interacts and intersects with the other categories and subcategories.

- As with the basic process, the coding process continues until the point of saturation and the identification of the core category. You may want to diagram your results, showing how subcategories and smaller concepts either contribute to the core concept or are caused by it or showing the consequences of the core concept or recommendations on how to respond to the core category.

- You will at this point begin engaging in sorting—where you sort your memos to help you ultimately build your theory. In this stage, you will also consult the literature to assist you in developing the theory, as you can spot connections between what is outlined in the literature and what you have discovered in your data.

- Grounded theory is not strictly a qualitative methodology; you can use this approach to assess quantitative data, coding it just as you would qualitative data. You will find that grounded theory is particularly useful in areas where theory isn't well developed, as this can be a useful way to engage in theory generation. Grounded theory is also used in many applied fields such as education, management, and health care.

The research methods rules and codes of behavior you've learned thus far are more like guidelines than formal rules. There is a set of procedures to follow that is widely accepted and practiced yet debated and critiqued.

OTHER QUALITATIVE APPROACHES

- **Discourse analysis** focuses on interpretation and meaning found in communication. It recognizes that communication is in its very nature performative, and as a result, words in whatever format cannot be taken at face value but must be assessed for deeper meaning. This is therefore a very interpretivist approach, focusing on subjective understanding and interpretations of meaning. The goal is to understand how and why that particular discourse or text—the choice of words and nonverbal cues—was chosen, what purposes it serves, and how it creates particular meanings and constructions. Discourse analysis can therefore be used to critically evaluate texts for the role of class, gender, wealth, culture, power, and other conditions in the production of the text. It can also focus on how language is used to establish subjects or objects as well as the historical context of how that particular set of understandings came about.

- **Conversation analysis** is very similar to discourse analysis and can in a way be considered a type of discourse analysis. Conversation analysis focuses on interpreting natural conversations rather than prewritten speeches, debates, or interviews. Like discourse analysis, it often looks at both verbal and nonverbal behaviors. As with grounded theory, the phenomena under study are not always identified at the outset but may be revealed through the process of data analysis, although theory and observation certainly play a role in the analysis. The goal is to identify the phenomena revealed in the conversation, the variation within that phenomena, and the reasons for that variation.

- **Narrative studies** focus on telling the story of one or a small number of individuals rather than to assess a small number of texts or naturally occurring conversations. The goal is to report the detailed experience of those individuals using their own words and descriptions of that experience. This is often the focus of studies that engage in biography or oral history. It is a collaborative style of research, where the subject provides the information about his or her life and experiences and the researcher interviews the subject extensively and crafts the story. The researcher may also use secondary sources to provide context for the time period or setting of the experiences recounted by the subject.

> The narrative studies approach can enable you to understand the complexity of someone's life and experience that can't be narrowed down to values on a variable. It can also challenge the conventional wisdom on a subject by providing a more nuanced and compelling look at it. Journalism can excel at this.

- **Phenomenological research** is closely related to narrative research. It focuses on exploring meaning in the experiences of people who have experienced a phenomenon—anything from having strong feelings, such as grief or anger, to graduating from an academic program or serving in the military. Essentially, the basic approach of qualitative analysis applies: You gather data from individuals in the form of interviews and other artifacts and analyze them for meaning, focusing on significant statements of how your subjects experienced the phenomenon in question. From this, you can develop broader descriptions of what happened and how and potentially identify common themes across subjects. This is particularly useful in research on counseling and therapy.

- **Content analysis** is a technique that is widely used in a variety of fields to evaluate qualitative data, although it is not necessarily a purely qualitative method. Content analysis is often used to assess data by counting frequencies of particular codes. Content analysis is usually used to assess artifacts of communication, such as speeches, news reports, and social media posts. You determine a set of codes at the start—either deductively through theory or inductively by initial analysis of data—but you generally don't continue to revise your codes throughout the process as you do in grounded theory. You also determine your units of analysis and generate categories of interest based on what makes sense for your research question. Whether the content you are interested in is manifest or latent, you will need clear criteria for what counts as a particular code. Then, you go through the data and code it or have a computer do it for you. You will typically start with a trial set of data to test your codes and adapt as needed before coding the rest of your data. Once you are done, you can run descriptive statistics to evaluate frequencies and other interesting correlations and patterns.

In essence, content analysis lets you take qualitative data and code it in a way where it can be quantitatively analyzed. In other words, you are quantifying qualitative data.

- **Process tracing** doesn't rely on coding like content analysis or memos like in grounded theory. This is a method largely used in case studies. Process tracing is about exploring how and why certain outcomes occur. It aims at evaluating evidence to understand the causal mechanisms that produce particular results—the decisions that are made and the events that transpire. By diving deep into data on a specific case, the researcher can dig into which variables matter and which don't in how a particular outcome occurred. This can be done deductively or inductively and is particularly useful in historical analysis. You assemble the information and trace the causal process from start to finish, looking at all the variables involved. The main goal is to evaluate potential causes and subject them to a variety of tests to determine the role they play in bringing about a particular outcome. These tests aim at determining whether these causes are necessary or sufficient contributions to the outcome of interest. Therefore, process tracing is a useful way to test for causality in qualitative case studies.

As with quantitative methods, there are many other approaches to qualitative analysis—each of which has its own debates surrounding it and variations you can employ. But you should now have a good sense of some of the options available for your project; what you choose will depend on the nature of your research.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, ch. 10.

Bennett, "Process Tracing and Casual Inference."

Edmonds and Kennedy, *An Applied Guide to Research Designs: Quantitative, Qualitative, and Mixed Methods*, chs. 12–14.

Glaser and Strauss, *The Discovery of Grounded Theory*.

Vanderstoep and Johnston, *Research Methods for Everyday Life*, ch. 9.

Waldner, "Process Tracing and Causal Mechanisms."

24

The Art of Presenting Your Findings

You need to put just as much thought into how you talk about your findings as you have into creating those findings in the first place. Once you know how to effectively communicate research results, you will be prepared to undertake your own research project and report your findings.

HOW TO CRAFT A FORMAL RESEARCH REPORT

- The first thing you have to do is figure out who your intended audience might be. Your audience is whomever you want to know about your findings—for example, a supervisor, your family, community stakeholders, potential donors, grant institutions, policy makers, scholars, students, or the general public. The type of communicating you do is highly dependent on this audience. How you write a scholarly article intended for other scholars is very different from how you might write a memo to your boss. If you don't think through your audience, your work might not get read.

- Once you've figured out your audience, it's time to start crafting your communication. Research is often shared in a formal report, but don't feel limited by that. There are plenty of more informal formats you can use to communicate your results, such as blog entries, social media, newspaper articles, and podcasts.

> The accusation that scholars write for themselves and each other and little of what they do is aimed at the general public is often referred to as the ivory tower of academia.
>
> It's a fair critique, and some efforts have been made to try to make scholarly work more available and palatable to the public.

- The key sections of a typical research report are as follows: front matter, introduction, literature review, theory, methodology, discussion of results, conclusion, and references.

FRONT MATTER

- Front matter is all the information you include before getting into your writing. This consists of the title page, acknowledgements, abstract, and table of contents.

    - The **title page** should include the title of your report and the names and affiliations of all the authors. It may also include the venue for the report, such as the name of a conference or meeting, and the date. Conventions depend on your discipline and preferred style guide, so consult examples to see how you should format yours.

> In some fields, the titles of reports are long and incredibly descriptive, while in others, short and clever titles are common. If you aren't sure what to title your report, go for a combination: Use something short and pithy, put in a colon, and then add a more descriptive subtitle.

    - The **acknowledgements** can be on a separate page in a longer report or thesis or may appear on the title page or in footnotes. There are a few acknowledgments you should consider. If you received funding or other forms of financial or technical support for any part of your research, you should note that here. It's also common to thank those who provided feedback—either those who gave comments on an earlier draft or anonymous reviewers. If you need to include a disclaimer about your work and any conflicts of interest, that should go here, too.

    - The **abstract** is a short summary of main claims, approach, and findings of your research. Typically, it's a paragraph, and while length can vary by field and venue, 300 words

> When it comes to the acknowledgments section, in longer projects, such as a dissertation or book, people will thank their families, editors, and others who provided emotional forms of support. This is not usually done in a typical research report.

is a good length to aim for. Regardless, the main idea is that if readers only have time to read the abstract, they can still get a good sense of what you did.

- In a longer report, you should include a **table of contents**. In academic work, this is typically only done in theses or book-length projects. Use your judgment on whether a table of contents is necessary. If the sections or chapters are a page or 2 each or there are only a handful of them, it's probably safe to skip it.

INTRODUCTION

- Once you are done with the front matter, you are ready for the beginning of your actual report: the introduction—which has to do at least 2 things.
  - **It needs a hook.** You need to convince readers, quickly, that your report is worth reading. They need to understand the puzzle, problem, or question that is driving your research and why they should care about it. This might involve telling a relevant anecdote or putting your project into its broader context so that people can see what is at stake. Don't assume your readers will care about your project just because you do. This is where you might give the normative motivation behind your empirical work.
  - **You should be up front about your claims and findings.** Don't be coy or toy with your readers and make them read the whole report to find out what you have concluded. Your report isn't a mystery novel. It's essentially a defense of your claims: You make your claim, and then everything else reveals how you got there.
- There are other things that can go in an introduction, such as a section-by-section roadmap that lays out what readers can expect in the rest of the report.

LITERATURE REVIEW

- The literature review section lays out the scope of the existing scholarly literature on your research question. This not only demonstrates your familiarity with what is already known, but also provides evidence that more work—your work—is necessary. This section can also lay the groundwork for your theory, hypotheses, and methodology sections by showing that your decisions in those areas are built on previously published work.

The literature review is covered in depth in lecture 5.

- A good literature review is organized not by source, but by topic. It's not simply a discussion of author 1 followed by author 2. Instead, you pull out the necessary themes or theoretical paradigms that need to be discussed to explain the roots of your own ideas and effectively put the authors in conversation with one another. Your goal is to identify and enter debates and fill gaps, so this conversation is necessary to show where those debates and gaps are.

WRITING TIPS

- Keep in mind that writing can be a very messy and nonlinear process. Don't feel like you need to start with the title or introduction and move straight through. Consider working from an outline and writing each part as inspiration strikes you.
- Be prepared to revise. Research itself is constantly subject to revision as feedback is received. Writing is the same. Don't assume that your first draft will be perfect.
- If you want to include graphics in your work that were created by someone else, make sure that either they are available through a creative commons license or you have permission of the rights holder to use them—and cite accordingly.

THEORY

- At some point, if your research is driven by theory, as a lot of positivist research is, you will need a section to discuss your theory. This might come directly out of the literature review itself or be its own section or chapter. This is where you build the theoretical basis for your claims and hypotheses—before you convey what the data says. Basically, this is where you explain why you tested what you did and why certain results should logically be expected from those tests. Not all work is driven by theory, however, so you might skip this section if it doesn't apply.

METHODOLOGY

- In the methodology section, you transparently report on the systematic and empirical practices you engaged in to achieve your results. All of the choices you've made throughout the research process are reported here. You should describe all of your methods: your overall approach, mode of data collection, population and sample, sources of data, and analysis procedures. If you conducted interviews or a survey, you can list the questions in this section or in an appendix. If your project was examined by an Institutional Review Board, you should note this somewhere in this section—and that you received the board's approval.
- But it's not enough to simply list what you did. You also need to justify your choices and discuss any limitations to your methods. For example, why was a survey the best way to go for this project?

If you are writing a grant proposal, this is the point at which your proposal will probably end, except for a section on budgets and timelines.

Everything up to this point—except noting your actual findings in the introduction—can probably be written prior to carrying out the data gathering and analysis.

DISCUSSION OF RESULTS

- The discussion of results section is what everyone is ultimately interested in. It's where you clearly describe the results of your data analysis, whether that is qualitative or quantitative. This could take the form of multiple case studies, each with its own section or chapter; the discussion of the core concept from grounded theory; or a series of tables and charts describing the results of your quantitative analysis. The key here is to make sure that you are including the appropriate amount of detail and evidence for your audience. A scholarly audience is going to expect much more detailed results and discussion than a general public audience.

- Some disciplines include a separate discussion section after the results where researchers discuss the implications of their results; others include that discussion in the results section itself. Your review of the literature will tell you what the norm is in your discipline, but keep in mind that you can't have just one or the other: You need both to report your results themselves and discuss their meaning and implications.

CONCLUSION

- Conclusions typically do 3 things.

  - **Summarize the key points of the paper.** Basically, a reader should be able to read the introduction and conclusion of a paper and have a pretty strong understanding of everything you did. This summary shouldn't be long, but it should remind readers of what they have learned.

  - **Discuss the implications of these findings for the broader normative context.** Based on your findings, what recommendations for action would you make? This is the other time in a paper (in addition to the introduction) when it's okay to make normative statements.

- **Note the next steps in the research project.** Now that you know this new piece of information, what is the next question that is raised? Given the limitations on the claims that you were able to make, what next steps would allow you to say a little more?

REFERENCES

- Different disciplines use different style guides—such as the *Chicago Manual of Style*—but the key to writing the references page is simply to list, in the appropriate style, all of the references cited in the report. This is a works cited page, not a works consulted page; if you didn't end up citing it, it generally should not appear on the list. Make sure you properly credit all your sources throughout the report with citations. In some disciplines and style guides, you'll use footnotes or endnotes rather than a references page, so, again, look to the literature for the most common choices in your area.

A presentation will include much of that same information as a formal report, just in an oral or visual format. If you are giving an oral presentation, you will want to hit the same points, but unless your workplace or discipline calls for a written script, your style will probably be more relaxed. If possible, have visual aids for your audience.

If your chosen method of communication is less formal, you will probably drop the literature review and methodology sections and simply refer to those if people ask about them or put them in an online appendix.

SHARING YOUR FINDINGS

- Once you've put together your report, presentation, review, email, or blog post, it's time to share it with the world.
- Research should be publicly shared to further the pursuit of knowledge or to show your funders, boss, or client that you carried out the project to completion.
- Nevertheless, sharing your findings can be a very nerve-wracking process. It invites criticism and rejection as well as praise and acceptance. It's normal if you feel anxious about sharing your work. But if you've done good work, there are others who might benefit from it.
- Keep in mind that review by others is a required step toward your work making a difference. Stakeholders and other interested parties need to weigh in on whether your work has merit and should be considered a new part of the scholarly literature.
- The formal version of this process is called peer review. In a scholarly academic journal, this is a very formal, double-blind process that can help ensure that good work is disseminated, regardless of who produced it. But there are also less formal kinds of peer reviews, such as restaurant reviews, product-testing reports, and movie-critic recommendations.

The process of peer review is covered in lecture 5.

How do you avoid getting drowned in negative comments or having your work rejected by reviewers?

- Before you share your work widely, let a few trusted people take a look—family members, friends, colleagues, mentors. They may be able to spot errors or confusion in your writing. You can even hire a professional copy editor to help you punch up your writing.

- Make sure whatever you are writing fits squarely within the aims and scope of the publication to which you plan to submit it. In other words, it's not enough to think through your audience; you also have to consider your venue.
- Don't let the perfect be the enemy of the good. Review is just another form of feedback, and it can help you improve your work. Nothing is ever perfect; share your work often and then incorporate the feedback into the next draft. Or, if you don't agree with the feedback or critique, stick to your guns and stand behind what you wrote.
- Have confidence in your own work, but recognize that you are always going to run into critique, criticism, and rejection. Rejection is part of the process. If you believe in your work, defend it and try again. At the same time, be prepared to face questions about your work. Consider in advance what kinds of questions might be coming your way and think about what your responses might be.

READINGS

Adams, Khan, and Raeside, *Research Methods for Business and Social Science Students*, chs. 15–16.

Powner, *Empirical Research and Writing*, chs. 9 and 11.

Silverman and Patterson, *Qualitative Research Methods for Community Development*, ch. 7.

Tracy, *Qualitative Research Methods*, ch. 14.

Quiz

1. Indicate whether each of the following claims is empirical or normative.

People who own cats are happier than those who own dogs.

a. empirical

b. normative

Everyone should own a cat.

a. empirical

b. normative

2. Four people are asked to judge a pizza-tasting competition. Prior to the beginning of the contest, they agree to judge the pizzas on taste, ingredient freshness, and appearance, but they do not discuss what would earn a pizza high or low marks in these categories. The following chart shows the scores awarded by the judges on 2 of the pizzas.

Points were awarded on a scale from 1 to 10, with 10 being high and 1 being low.

	Amazing Pizza Land			Pizza Palazzo		
Judge	Taste	Ingredients	Looks	Taste	Ingredients	Looks
Joshua	10	10	10	10	10	10
Lindsey	4	2	4	8	6	9
Ray	5	5	5	3	5	5
Kyra	1	1	1	1	1	1

Does the judging of this contest pose a potential problem of **(a)** reliability, **(b)** validity, **(c)** both, or **(d)** neither?

3. Which of the following is a principle found in *The Belmont Report* on research ethics?

a. justice
b. beneficence
c. respect for persons
d. all of the above
e. none of the above

4. True or false? The scientific method is a linear process of steps that everyone follows in a set order regardless of their project.

5. A sample where every member of the population has an equal chance of joining is called a __________ sample.

6. At what level of measurement (nominal, ordinal, interval, or ratio) is each of the following variables?

a. dog breed
b. year people graduated from high school
c. satisfaction with customer service, measured on a 5-item scale from very satisfied to not at all satisfied
d. number of books you own

7. In qualitative analysis, you often continue to gather and analyze data until you've reached the point where more data or analysis does not lead to additional insights. This is called the point of __________ .

8. The literature review is best described as which of the following?

- **a.** the process of finding and evaluating a body of scholarly work on a topic
- **b.** thoroughly reading great literary classics to expand your cultural horizons
- **c.** the section of a research report that notes the debates, gaps, and themes in prior findings
- **d.** all of the above
- **e.** a and c

9. Which of the following is NOT a key characteristic of good research?

- **a.** Research should be systematic.
- **b.** Research should be secretive.
- **c.** Research should be empirical.
- **d.** Research should be objective.

10. True or false? The following is a good hypothesis:

There is a negative relationship between wall color and mood.

11. What is the likely unit of analysis for the following hypothesis?

People who live in the United Kingdom are more likely to sleep without a top sheet on their bed than people who live in America.

12. You are running an experiment to definitely decide which type of animal makes people happier: cats or dogs. You recruit from your friends and family and place them into 2 groups, according to whether they claim to prefer dogs or cats. Each group plays with cats for 10 minutes, followed by dogs, and then the participants answer a questionnaire at the end about how they felt after playing with each type of animal. To your surprise, it turns out that people were happier playing with dogs.

When you turn in your results, your research is rejected for publication. Which of the following did you forget to do in your experiment?

a. random assignment to groups

b. measure the dependent variable

c. include a control group

d. all of the above

e. a and c only

13. Quinn and Teagan are working on an experiment together. They started with 90 participants, but over the course of the 2-hour experiment, their subject pool has dwindled down to just 40 people. Many of the people who left the experiment were younger than those who stayed.

What threat to validity should most concern Quinn and Teagan about these events?

a. maturation effects

b. mortality effects

c. Hawthorne effects

d. history effects

14. Suppose that a national survey was done to determine whether people favored or opposed stricter laws on puppy mills. The survey results indicated that 70% favored stricter laws, 23% opposed, and 7% were undecided. The margin of error for the survey was ±3%, and the confidence level was 0.05. Which of the following is the best interpretation of the 70% figure for those who favored stricter puppy mill laws?

a. There are 5 chances out of 100 that this survey result is within 3% of the results that would be attained if the survey were done again immediately.

b. There are 3 chances out of 100 that in the population from which the sample was selected the percentage who favor stricter puppy mill laws is somewhere between 65% and 75%.

c. There are 5 chances out of 100 that more than 3% of the respondents gave wrong answers to the question.

d. There are 95 chances out of 100 that in the population from which the sample was selected the percentage who favor stricter puppy mill laws is somewhere between 67% and 73%.

15. Which is the best evaluation of the following survey question?

Do you think climate change is a big hoax, of grave concern, a significant problem, or a scientific conspiracy?

a. This question is fine.

b. This is a double-barreled question.

c. The jargon in this question makes it unanswerable.

d. The answer choices are neither exclusive nor exhaustive.

16. One of the big differences between quantitative and qualitative analysis is in the size of the __________ they analyze.

17. A type of research where you are working with a community to solve a problem, rather than aiming at theorizing about wider phenomena, is called __________ .

18. What is the type of research called where you gather together a group of people to have a conversation, getting insight not only from the individuals but from the dynamics and conversation between them?

a. structured interview

b. qualitative analysis

c. election poll

d. focus group

19. In a normal distribution, the values of the mean, median, and mode are __________ .

20. What calculation is done to determine whether there is a correlation between 2 ratio-level variables?

a. chi-squared

b. paired *t*-test

c. Pearson's *r*

d. *z*-scores

21. Which of the following is NOT a strong indicator of a source being a scholarly one?

a. It receives a lot of attention on mainstream and social media.

b. It is written for an audience of experts.

c. It has been peer reviewed.

d. It was published by a university press or academic journal.

e. All of the above are strong indicators.

22. When scholars are accused of being part of the so-called ivory tower, what does that mean?

- **a.** They live in isolated college towns and rarely interact with people in their community.
- **b.** Most of them are concentrated in Ivy League schools.
- **c.** Their research is isolated and not focused enough on practical, everyday concerns.
- **d.** They are good at communicating their findings to everyday people but not very good at listening to peers at lesser institutions.

23. If you were told that the results of a regression model with an *n* of 2000 were an *r*-squared of 0.82, betas that were large relative to their errors, and *p*-values of less than 0.05 for the key independent variables, would you throw out this model or pursue it further?

24. If a case has a *z*-score of −3.87 in a normal distribution, how would you describe that case?

- **a.** representative case
- **b.** deviant or extreme case
- **c.** critical case
- **d.** revelatory case
- **e.** longitudinal case

25. Which of the following are the requirements to be confident you have found a causal relationship between variables?

- **a.** Correlation implies causation, so as long as you can show a correlation, you are fine.
- **b.** correlation and temporal order
- **c.** correlation, temporal order, and a theoretical explanation
- **d.** correlation, temporal order, a theoretical explanation, and elimination of alternative explanations
- **e.** There are no clear-cut requirements for establishing a causal relationship between variables.

Answers and Explanations

1. Indicate whether each of the following claims is empirical or normative.

People who own cats are happier than those who own dogs.

a. empirical

b. normative

Everyone should own a cat.

a. empirical

b. normative

Empirical statements are those that attempt to describe how the world actually works, while normative statements tend to either pass judgments or proscribe behavior.

2. Four people are asked to judge a pizza-tasting competition. Prior to the beginning of the contest, they agree to judge the pizzas on taste, ingredient freshness, and appearance, but they do not discuss what would earn a pizza high or low marks in these categories. The following chart shows the scores awarded by the judges on 2 of the pizzas.

Points were awarded on a scale from 1 to 10, with 10 being high and 1 being low.

	Amazing Pizza Land			Pizza Palazzo		
Judge	Taste	Ingredients	Looks	Taste	Ingredients	Looks
Joshua	10	10	10	10	10	10
Lindsey	4	2	4	8	6	9
Ray	5	5	5	3	5	5
Kyra	1	1	1	1	1	1

Does the judging of this contest pose a potential problem of **(a)** reliability, **(b)** validity, **(c)** both, or **(d)** neither?

Even without looking at the results, not providing a clear set of guidelines or criteria on how to judge creates a reliability problem—judges Joshua and Kyra clearly are not using the same criteria—and a problem with reliability means there is also a problem with validity.

3. Which of the following is a principle found in *The Belmont Report* on research ethics?

a. justice

b. beneficence

c. respect for persons

d. all of the above

e. none of the above

The *Belmont Report* clearly cites justice, respect for persons, and beneficence as the 3 key principles of ethical research.

4. True or false? The scientific method is a linear process of steps that everyone follows in a set order regardless of their project.

false

Sometimes the scientific method is linear and the steps are set. Other times the process is more cyclical or has multiple feedback loops. The steps can differ based on the researcher's approach, project, or discipline. There is no need to adhere to a rigid set of steps, so long as you complete the basic aspects of it that are necessary to produce good research.

5. A sample where every member of the population has an equal chance of joining is called a random sample.

> Compare this to a non-probability sample, where the chance of any one member of the population entering the sample is unknown.

6. At what level of measurement (nominal, ordinal, interval, or ratio) is each of the following variables?

a. dog breed
nominal

> Dog breeds are different categories but don't have an intuitive ranking order.

b. year people graduated from high school
interval

> The years people graduated are different categories that can be put in order and defined in terms of distance, but they do not have a true zero that allows for percentage- or ratio-style calculations.

c. satisfaction with customer service, measured on a 5-item scale from very satisfied to not at all satisfied
ordinal

> There are different categories that can be ranked in order.

d. number of books you own
ratio

> This is a pure count of different categories with a true zero, as a zero means an absence of books owned.

7. In qualitative analysis, you often continue to gather and analyze data until you've reached the point where more data or analysis does not lead to additional insights. This is called the point of saturation.

In many forms of qualitative research, data collection and analysis occur at the same time. Data collection stops when there is no further value in more data collection—the point at which the data set and analysis are thoroughly saturated.

8. The literature review is best described as which of the following?

a. the process of finding and evaluating a body of scholarly work on a topic

b. thoroughly reading great literary classics to expand your cultural horizons

c. the section of a research report that notes the debates, gaps, and themes in prior findings

d. all of the above

e. a and c

While reading literary classics is always recommended, it's not going to be a part of your research process outside of the field of literature or a project specifically aimed at understanding great literature. For your purposes in research, the literature review is both a process and a section of your report.

9. Which of the following is NOT a key characteristic of good research?

- **a.** Research should be systematic.
- **b.** Research should be secretive.
- **c.** Research should be empirical.
- **d.** Research should be objective.

Research should be transparent, not secretive. While you may want to be secretive about your project while it is going on, once it is ready to be shared, your data and procedures should, whenever possible, be transparently reported to allow for review and replication.

10. True or false? The following is a good hypothesis:

There is a negative relationship between wall color and mood.

false

While there may indeed be a relationship between wall color and mood, you would not describe this as a negative relationship. A negative relationship means that as one variable increases, the other decreases. While mood could be operationalized in a way that increasing and decreasing makes sense, it is hard to see how wall color could be. Wall color is a clear nominal variable. This is not, therefore, a good hypothesis.

11. What is the likely unit of analysis for the following hypothesis?

People who live in the United Kingdom are more likely to sleep without a top sheet on their bed than people who live in America.

individuals (or countries)

The unit of analysis is the ordering unit you use for data gathering purposes. In this case, it looks like the data would be gathered at the individual level. If this data has already been collected, it is possible that you might aggregate data on the use of top sheets in the 2 countries. This would give you just 2 data points (one for the US and one for the UK), and your unit of analysis would be the country.

12. You are running an experiment to definitely decide which type of animal makes people happier: cats or dogs. You recruit from your friends and family and place them into 2 groups, according to whether they claim to prefer dogs or cats. Each group plays with cats for 10 minutes, followed by dogs, and then the participants answer a questionnaire at the end about how they felt after playing with each type of animal. To your surprise, it turns out that people were happier playing with dogs.

When you turn in your results, your research is rejected for publication. Which of the following did you forget to do in your experiment?

a. random assignment to groups
b. measure the dependent variable
c. include a control group
d. all of the above
e. a and c only

> This is not a great experiment for many reasons, not just the few included in the multiple-choice options. But let's stick to those. Groups are assigned based on animal preference, not randomly, and there is no control group—both groups received exactly the same treatment. There is a measure of the dependent variable, however, in the questionnaire.

13. Quinn and Teagan are working on an experiment together. They started with 90 participants, but over the course of the 2-hour experiment, their subject pool has dwindled down to just 40 people. Many of the people who left the experiment were younger than those who stayed. What threat to validity should most concern Quinn and Teagan about these events?

a. maturation effects
b. mortality effects
c. Hawthorne effects
d. history effects

> Subjects leaving the experiment early raises concerns of mortality: the premature loss of subjects. There is no evidence of the reactivity found in Hawthorne effects, and not enough time has passed for maturation or history effects to be a real concern.

14. Suppose that a national survey was done to determine whether people favored or opposed stricter laws on puppy mills. The survey results indicated that 70% favored stricter laws, 23% opposed, and 7% were undecided. The margin of error for the survey was ±3%, and the confidence level was 0.05. Which of the following is the best interpretation of the 70% figure for those who favored stricter puppy mill laws?

- **a.** There are 5 chances out of 100 that this survey result is within 3% of the results that would be attained if the survey were done again immediately.
- **b.** There are 3 chances out of 100 that in the population from which the sample was selected the percentage who favor stricter puppy mill laws is somewhere between 65% and 75%.
- **c.** There are 5 chances out of 100 that more than 3% of the respondents gave wrong answers to the question.
- **d.** There are 95 chances out of 100 that in the population from which the sample was selected the percentage who favor stricter puppy mill laws is somewhere between 67% and 73%.

The key to understanding margin of error in any polling result is to read the estimated number as a range. Because this result is 70% with a 3% margin of error, that means the actual range is 67% to 73%. And because there is uncertainty when working with a sample rather than a population, the researcher wants to know the level of confidence for those results. A 0.05 level means that there is a 5% chance that these results are completely wrong—and a 95% chance that they are within that estimated range.

15. Which is the best evaluation of the following survey question?

Do you think climate change is a big hoax, of grave concern, a significant problem, or a scientific conspiracy?

a. This question is fine.

b. This is a double-barreled question.

c. The jargon in this question makes it unanswerable.

d. The answer choices are neither exclusive nor exhaustive.

The issue with this question is the answer choices. “Big hoax” and “scientific conspiracy” mean mostly the same thing, as do “grave concern” and “a significant problem,” and there are no neutral options or the ability for the person to say he or she doesn’t know or doesn’t have an opinion. It is not a double-barreled question, it is not using complex jargon, and it is definitely not fine.

16. One of the big differences between quantitative and qualitative analysis is in the size of the *n*, or number of cases they analyze.

While it is certainly not the only difference, generally quantitative analysis is done when you have a large *n* and qualitative analysis is preferred when your *n* is small.

17. A type of research where you are working with a community to solve a problem, rather than aiming at theorizing about wider phenomena, is called action research.

Action research aims at addressing a problem within a particular community rather than solving wider puzzles. The researcher often works with the community to design and carry out the project.

18. What is the type of research called where you gather together a group of people to have a conversation, getting insight not only from the individuals but from the dynamics and conversation between them?

a. structured interview
b. qualitative analysis
c. election poll
d. focus group

Focus groups are commonly used to gather information from groups of people at a time. They may meet once or several times over a period of time and allow for facilitators to see how members of the group react to each other in addition to how they react to the questions and the interviewer.

19. In a normal distribution, the values of the mean, median, and mode are equal to each other.

This is a key characteristic of a normal distribution. All the measures of central tendency are the same.

20. What calculation is done to determine whether there is a correlation between 2 ratio-level variables?

a. chi-squared
b. paired *t*-test
c. Pearson's *r*
d. *z*-scores

Pearson's *r* is also known as the correlation coefficient. While these other calculations may be valuable in analyzing your data, and others not listed here will tell you about correlation, Pearson's *r* is where you might start with investigating a correlation between 2 variables.

21. Which of the following is NOT a strong indicator of a source being a scholarly one?

- **a.** It receives a lot of attention on mainstream and social media.
- **b.** It is written for an audience of experts.
- **c.** It has been peer reviewed.
- **d.** It was published by a university press or academic journal.
- **e.** All of the above are strong indicators.

While some of the best scholarly sources may receive mainstream attention, that is not a requirement or an indicator of a source being scholarly. Articles in news magazines or opinion pieces may get mainstream attention, but this does not make them scholarly. Likewise, many articles stay within scholarly circles and never receive attention outside of them, but this does not make them less scholarly.

22. When scholars are accused of being part of the so-called ivory tower, what does that mean?

- **a.** They live in isolated college towns and rarely interact with people in their community.
- **b.** Most of them are concentrated in Ivy League schools.
- **c.** Their research is isolated and not focused enough on practical, everyday concerns.
- **d.** They are good at communicating their findings to everyday people but not very good at listening to peers at lesser institutions.

The ivory tower accusation claims that scholars are talking only to each other and not to general audiences about research that affects everyday lives.

23. If you were told that the results of a regression model with an *n* of 2000 were an *r*-squared of 0.82, betas that were large relative to their errors, and *p*-values of less than 0.05 for the key independent variables, would you throw out this model or pursue it further?

pursue it further

While you would want more information before rejecting the null hypothesis, these would indicate strong results that warrant more attention.

24. If a case has a *z*-score of −3.87 in a normal distribution, how would you describe that case?

- **a.** representative case
- **b.** deviant or extreme case
- **c.** critical case
- **d.** revelatory case
- **e.** longitudinal case

A *z*-score of −3.87 indicates a case that is an outlier. In a normal distribution, 99% of cases fall within 3 standard deviations of the mean and therefore will have *z*-scores of 3 or less. So, a *z*-score of −3.87 means that this case falls 3.87 standard deviations below the mean. As a clear outlier, this would be best described as a deviant or extreme case and might be worth studying in a case study approach.

25. Which of the following are the requirements to be confident you have found a causal relationship between variables?

a. Correlation implies causation, so as long as you can show a correlation, you are fine.

b. correlation and temporal order

c. correlation, temporal order, and a theoretical explanation

d. correlation, temporal order, a theoretical explanation, and elimination of alternative explanations

e. There are no clear-cut requirements for establishing a causal relationship between variables.

Correlation never implies causation by itself. There are 4 requirements to be confident in finding a causal relationship.

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