

Concepts, Conceptualizations, Operationalizations, Measurements, Variables, and Data

Learning Objectives

After finishing this chapter, you should be able to:

- 4.1 Summarize what a concept is, compare how it is related to a variable, describe how it is related to different types of research, and identify why it is important.
- 4.2 Define and describe conceptualization, including its importance in conducting different types of research.
- 4.3 Identify the role of operationalization and how it differs from conceptualization. Describe how operationalization and conceptualization differ when using quantitative and qualitative data.
- 4.4 Summarize what variables are, how they are related to concepts, and the role they play in research. Be able to describe the characteristics and types of variables used in research.
- 4.5 Define measures, and provide examples of measures you see in research. Identify how measures and data are related to one another.
- 4.6 Be able to list, compare, and contrast the four levels of measurement and how each is distinguished from the other. Evaluate why it is important to make these distinctions when conducting research.

Quantitative data: Numerical data. Research using quantitative data generally uses deductive reasoning.

Deductive reasoning: Approach in which the researcher begins with broad or general statements that are used to derive more specific statements. Used in research that begins more generally and works to more specificity. Commonly used in research using quantitative data.

Introduction

You now have a research question and a quality literature review; now you are ready to begin planning the details associated with your research. To do so, you must begin thinking about concepts, conceptualizations, operationalizations, measurements, variables, and data, and the role of each in your research. Regardless of the purpose of your research, you must consider these things. Nevertheless, how you think about these elements depends, in part, on the type of data you will ultimately need to collect.

Two Primary Types of Data: Quantitative and Qualitative

Two primary types of data are used in criminology and criminal justice research: quantitative and qualitative. Research using quantitative data uses numerical data to quantify something about a topic. With quantitative data, a person can understand how many offenders recidivated, the rate of offending in the past year, the number of female police officers that are employed full time, or opinions measured on a scale from one (dislike) to ten (like). In using these numeric data, a researcher then calculates statistics, and findings and conclusions are offered. Research based on quantitative data is generally conducted by using deductive reasoning. **Deductive reasoning** means that the researcher begins more generally and works to more specificity. Many of our featured case studies used deductive reasoning and quantitative data. One specific research question posed by Chris Melde and colleagues (Melde, Taylor, & Esbensen, 2009) was, "What is the effect of gang membership on self-reported victimization among adolescents?" To answer this, Melde et al., gathered numerical data on whether an adolescent was in a gang and whether he or she had been victimized. With those data, Melde and colleagues calculated statistics and offered conclusions. Melde and his collaborators went into this research with clear boundaries regarding the data they needed to answer their research question. Similarly, Carlos Cuevas and colleagues (Sabina, Cuevas, & Cotignola-Pickens, 2016) posed four research questions that identified the specific things they would gather data about, analyze, and offer a conclusion. Recall their four research questions:

1. What are the rates of dating violence by victim gender?
2. What is the risk of experiencing dating violence over time?
3. Is dating violence victimization associated with other forms of victimization?
4. What cultural factors (e.g., immigrant status, familial support) are associated with dating violence over time?

These questions show that Cuevas and his team needed to gather data on dating violence, gender, risk associated with dating violence, other types of victimization, and cultural factors. They were not interested in understanding whether some other unrelated thing such as vacation locations was important to consider. Rather, Cuevas and his colleagues worked within specific conceptual boundaries to answer their research questions.

Other scientific research uses qualitative data. Research relying on **qualitative data** is conducted using **non-numerical data** such as text from transcribed interviews, narratives, published documents, videos, music, photos, observations, body language, and voice intonation, to name a few. In thinking back to Mary Dodge's exploratory research on policewomen decoys (Dodge, Starr-Gimeno, & Williams, 2005), the literature provided no guidance except for speculation about how women view this work. Because of that, Dodge, another of our featured researchers, and her colleagues found the best approach would be to gather qualitative data via interview. By gathering qualitative data, they were able to learn a great deal about officers' views of being a decoy, fears associated with this role, and how to walk, dress, and behave to be convincing. Therefore, they would not be constrained to preconceived notions about the work. Rather, those engaged in the work could tell Dodge and her colleagues what was and was not important and meaningful. Qualitative data are generally conducted using inductive reasoning. **Inductive reasoning** means that a researcher begins more specific and works to greater generality. The researcher begins with specific observations, interviews, or other data collection and uses the data gathered to make general statements about the topic of interest. Research using qualitative data is frequently, but not always, used in an exploratory manner. Research relying on qualitative data does not have the goal of counting or quantifying a topic; instead, its goal is to deeply and richly understand the topic and nuances about the topic.

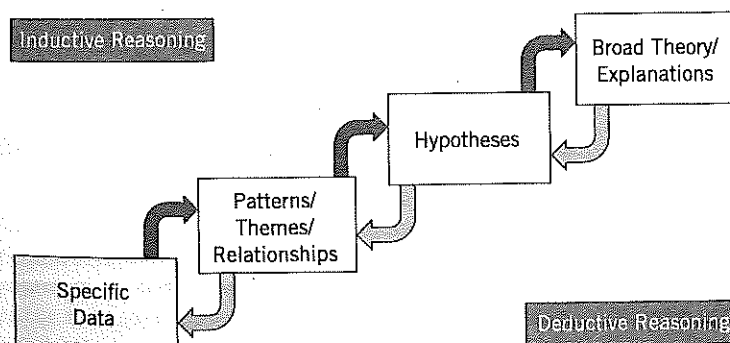
Often, the decision to use a quantitative or qualitative data (or both) is guided by the research purpose and question (see Figure 4.1). If you know nothing or little about a specific topic, gathering qualitative data may be the best approach. The undercover officer sting research conducted by Mary Dodge et al. (2005) and the research by featured researcher Rod

Qualitative data:
Non-numerical data. Researchers using qualitative data generally use inductive reasoning. Qualitative data are available in numerous formats, including texts, narratives, published documents, videos, music, photos, recordings, observations, participating, body language, and so on.



Inductive reasoning: Used in research that begins more specific and works to greater generality. Commonly used in research using qualitative data.

Figure 4.1 Inductive and Deductive Reasoning Illustrated





Brunson (Brunson & Weitzer, 2009) on adolescent youth perceptions and experiences with police both used this approach. In fact, Brunson and his colleague begin their literature review by noting that “most of the literature is quantitative, and it is important to complement these studies with qualitative research to document complex and nuanced citizen understandings of police practices. Only a handful of qualitative studies of either adults or youth exist” (Brunson & Weitzer, 2009, p. 861). Both Dodge and Brunson, along with their colleagues, gathered qualitative data to answer their exploratory research questions to gain a broad yet nuanced understanding of a topic. If, on the other hand, a fair amount of knowledge has accumulated about a topic and the goal is to explain something about it, then using quantitative data might be the best approach. Our featured researchers Heather Zaykowski, Carlos Cuevas, Chris Melde, and Rachel Boba Santos each used or gathered quantitative data to answer their research questions. Evaluation research frequently uses both quantitative and qualitative data. An evaluation may involve gathering numerical data to answer a research question. But it may also include gathering of non-numerical data in the form of interviews, focus groups, observing interactions, or studying documents to answer some other research question.

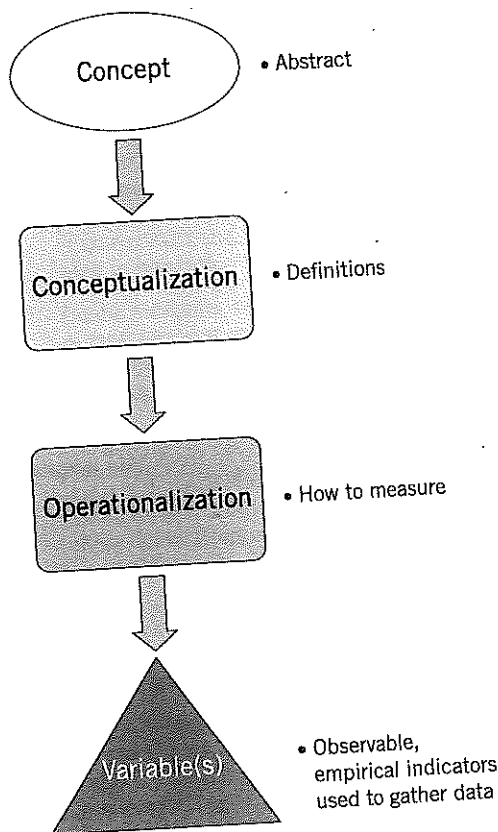
The decision about whether a researcher will use qualitative or quantitative data, or both, is important to make early in a research project. This is because the data required will influence how a researcher thinks about concepts, conceptualizations, operationalizations, and variables—the topics of this chapter—prior to gathering the data. For example, the qualitative data gathered are often used to identify the important concepts related to the topic of interest, gather an understanding about what their subjects (often people) identify as relevant concepts, as well as how the subjects define them (i.e., moving from the more specific to the more general). This approach entails being open to learning their subjects’ views on important definitions, conceptualizations, and variables. In contrast, researchers intending to use quantitative data must identify the abstract unobservable concepts relevant to their research and describe how they will measure them using variables before gathering data.

The remainder of the chapter discusses these important elements. We begin by first identifying why careful consideration of these concepts, measurements, and variables are important. Then we describe each of these using examples. The chapter concludes with a discussion of ethics and common pitfalls, as well as with an interview with Brenidy Rice, who makes a living focusing on these elements of research while conducting and overseeing research for the state of Colorado.

Why Focus on Concepts, Conceptualizations, Operationalizations, Measurements, Variables, and Data?

Understanding concepts, definitions, measurements, and variables is important because without them a researcher simply could not conduct research. For the researcher gathering and using quantitative data, it would be difficult to systematically move from an unobservable abstract concept to measureable and

Figure 4.2 Stages to Go From Concept to Variables



observable variables. For the researcher gathering and using qualitative data, important information about a research topic may be overlooked and missed. Without an understanding of these elements of research, a researcher could not conduct research well.

To conduct research using quantitative data, a researcher has identified from the literature (and noted in the literature review) important concepts about which he or she needs to gather data. A critical step in this type of approach is to make those abstract concepts into measureable variables. To do so, researchers engage in several basic stages, moving from the abstract to the concrete. Figure 4.2 depicts these stages of identification of a concept, the creation of a conceptual definition, and a detailed plan for indirectly measuring that concept that results in a variable. After these stages, you can develop variables to gather data that serve as proxies for the concepts.

Concept: Abstract, mental pictures of things that exist only in our minds. Examples include gender, victim, injury, recidivism, and rehabilitation.

What Are Concepts?

One of Zaykowski's (2014) research questions is as follows: What factors are associated with use of victim services? In particular, Zaykowski examines how things like reporting to the police, victim's demographics, the victim's relationship to the offender, and the victim's mental and physical distress are associated with the use of victim services. To answer her research question, she ultimately has to gather empirical data on each of these things. These things are concepts that are abstract, mental pictures that exist in our minds. They are not empirical (i.e., observable), tangible, and cannot be touched. Zaykowski noted in a video interview conducted for this book that "[w]hen we study victimization, victimization is a concept but one can't just say this is victimization, or that is victimization, a researcher must address what exactly they mean by victimization." We think about and communicate about our world and our research using concepts. Our ability to communicate using concepts is possible because individuals have a general agreement regarding the meaning of particular concept.

The focus on concepts differs slightly given the purpose of one's research. In exploratory research, a researcher is generally motivated to use the data to *identify* the concepts of importance. In descriptive research, a researcher frequently is already aware of the concepts of interest. Their ultimate goal is to *describe* what is known about concepts and how they are related or associated with one another. In explanatory and some evaluation research, a researcher is focused on identifying how some concepts *affect, influence, or predict* other concepts. Understanding that concepts are abstract mental images, and that research is focused on identifying, describing, or explaining how concepts are related, should make clear why these are the most basic building blocks of conducting research.

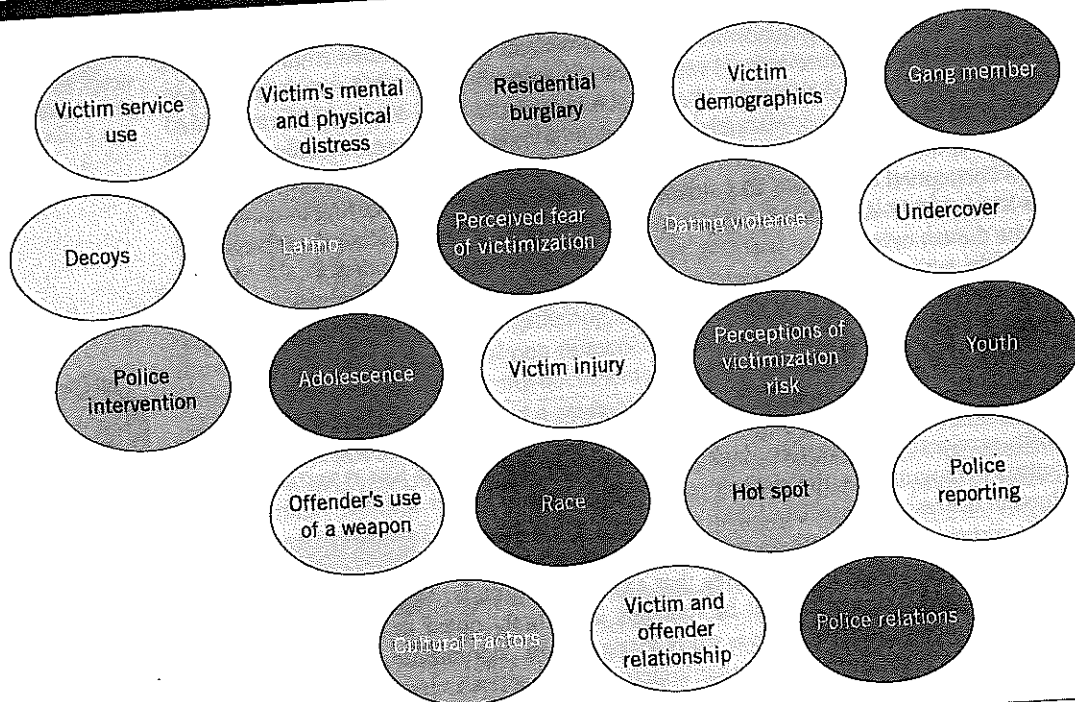
Examples of Concepts

Our case studies focus on several concepts in their research. Consider the work of Melde who focuses on concepts such as gang members, victimization, perceptions of victimization, victimization risk, adolescence, and perceived fear (Melde et al., 2009). Zaykowski's (2014) work points to several concepts of interest including police reporting, victim demographics, use of victim services, victim's distress, and so on. Consider Cuevas's research, which is focused on concepts such as cultural factors, dating violence, gender, Latinos, and other types of victimization (Sabina et al., 2016). The work of Santos focuses on concepts including hot spots, residential burglary, and offender-focused police intervention (Santos & Santos, 2016). Some of these abstract concepts are illustrated in Figure 4.3.

In contrast, Dodge's work needed to identify what the women who worked as prostitution decoys identified as important concepts (Dodge et al., 2005). Similarly, Brunson started his exploratory research on youths' views and experiences with police with little notion as



Figure 4.3 Several Case Study Concepts



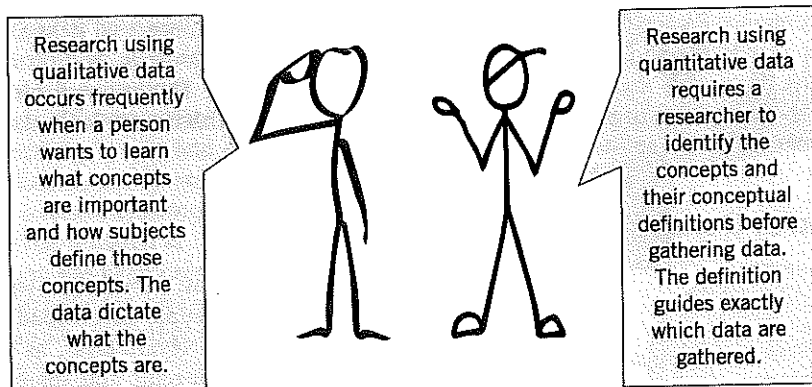
to what these youths thought were important concepts (Brunson & Weitzer, 2009). Beyond knowing that they wanted to compare experiences and perceptions of the youths in three neighborhoods, the researchers allowed many important concepts to be identified by the respondents during the interviews.

There is an endless number of concepts in criminal justice and criminology. Consider the examples of criminology and criminal justice concepts shown in Table 4.3. What characteristics do all concepts have in common? First, all concepts are abstract. Second, people in society have a *general* agreement regarding what concepts refer to. This general agreement about meaning allows individuals to communicate with one another about ideas and thoughts. Third, because they are abstract, concepts are not directly measurable.

Having generally agreed ideas about what abstract concepts refer to may be adequate to get along successfully in everyday life. It is not adequate when conducting research. Why? First, because concepts are not directly measurable, it is impossible to conduct research using concepts. Researchers who want to measure the concepts must use something measurable to represent the concepts. Second, although individuals may have a *general* agreement about what is meant by a concept, people do not share specific, detailed agreement about what is meant by each concept. You and those you know do not share the same specific notion about what constitutes an injury, intelligence, violence, an elder, kindness, happiness, a victim, or recidivism. Therefore, when conducting research using quantitative data, it is critical that the researcher clearly *define and identify the specific measurable elements of each concept* prior to gathering the data. When conducting research using qualitative data, it is critical to allow subjects to define the concepts they identify as important. The researchers' ideas about definitions may not match or even be close to how subjects view them. A great example of learning about definitions while gathering data (versus clarifying definitions prior to gathering data) is found in Dodge's research (Dodge et al., 2005). During Dodge's interviews, it was revealed



Figure 4.4 Understanding Research Using Quantitative and Qualitative Data



how decoy officers' defined being a successful decoy. A successful decoy is one who went barefooted, had messy/dirty hair, and a particular way of standing and walking. Other concepts and definitions were also revealed in Dodge's data gathering including sexual concepts such as "half-an-half" and "around the world" (see Dodge et al., 2005, for more information). For more understanding of research using quantitative and qualitative data, see Figure 4.4.

What Is Conceptualization?

As noted, a researcher cannot directly measure concepts because they are abstract. Yet, researchers are interested in understanding, exploring, examining, or investigating concepts and how they are associated or related to one another. To do so, definitions of the concepts must be identified. For the researcher using qualitative data, this means gathering data that provide insight into their subjects' definitions of important concepts. For example, in Brunson's research, the definition of "crooked cops" was revealed (and supported in other literature) and defined:

Most Barksdale and Hazelcrest youth said that their communities were plagued by some "crooked cops"—a term frequently used (see also Carr, Napolitano, and Keating 2007). Martez observed, "They'll sell you crack, weed, X [ecstasy], and then will turn around and have you locked up." And David explained, "If somebody got pulled over and they had drugs and money on them, a lot of times the cops will search 'em and take the drugs and money and then lock 'em up. . . . They don't turn it in for evidence; they keep it for they self." "The undercover ones is crooked," Kyle observed. "The undercover ones get away with it because we can call the station up and report the [officers] in uniform, but we can't report the undercover ones" because their identities are often masked. (Brunson & Weitzer, 2009, p. 873)

In contrast, the researcher using quantitative data must develop *specific* detailed definitions of each concept of interest prior to gathering the data. In the parlance of research methods, the researcher using quantitative data develops a conceptual definition via conceptualization.



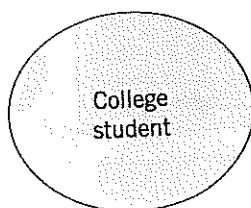
Conceptualization: Process of precisely, accurately, comprehensively, and clearly defining what is meant by a particular concept. The resulting definition from this process is a conceptual definition.

Conceptual definition: Precise, accurate, comprehensive, and clear definitions resulting from conceptualization.

Operationalization: Process in which a researcher identifies how each concept will be measured based on the conceptual definition.

Conceptualization is a process of defining what is meant by a particular concept. The resulting definition is a **conceptual definition**. The definition must be comprehensive and clear and accurately reflect the underlying concept that it describes. For those who will be gathering and using qualitative data, developing a conceptual definition prior to the research is less common. Rather, the data collected dictates respondents' conceptual definitions. In Santos' research, she and her colleague had to take the concept "hot spot" and turn it into something observable and measurable (Santos & Santos, 2016). This research ultimately defined "hot spots" as a combination of residential census blocks that are similar in size (0.60 square miles) and had at least 15 reported crimes in the last year.

Example: Conceptualizing College Student



Consider the concept of "college student." How might you conceptualize this concept? In general, people have broad agreement as to who a college student is. Nevertheless, as should now be clear, there is no universally specific and shared definition about who a college student is. For that reason, as a researcher, you must conceptualize or define this concept to conduct research on it.

How would you conceptualize "college student?" Here are a few examples:

- Someone living on a university campus at a four-year university.
- People currently enrolled in any number of college courses whether online or in person.
- Individuals, 18 to 24 years of age, who have attended a university either online or in person, public or private, within the last six months.
- People who have graduated from high school and are obtaining additional education at a vocational school, community college, junior college, or four-year university.

As these few examples indicate, there are many ways to conceptualize "college student." Each of these ways has ramifications about from whom data will be gathered. These four examples demonstrate that a researcher must think about several elements that make a college student. First, you must consider what is meant by a college or university. Does it refer to only a traditional brick-and-mortar four-year university? Or does it include community colleges and vocational schools? Must it be a public university? Or can it be private? Do religious universities count? Second, you must consider what is meant by student. Is there an age limit of who is a college student? Must someone be currently enrolled in courses, or can he or she have been enrolled in the last six months (or a year)? Must a person be enrolled at least part time, or must he or she be enrolled full time only?



Much research focused on college students defines them as persons age 18 to 24. Is this the best approach? Why or why not?

What if the student takes only online courses—is he or she a college student? Can a senior citizen taking an online course in ornithology from a university in state different from their residence be considered a college student? Is where a person lives related to one's status as a college student? Must a person live on a college campus in a dormitory to count as a student? What if someone lives at home with his or her parents? Which conceptual definition would you use to

accurately define the concept of college student? Given this discussion, are you wondering how “college student” has been conceptualized in the research on college student sexual misconduct that is so prominent in the news these days? You should be because it might surprise you.

Keep in mind that there may be frequently used conceptual definitions of concepts identified in the literature. If appropriate, it is acceptable to build off this existing work and use that conceptualization. Nevertheless, the researcher must be careful to ensure that a selected existing conceptualization is appropriate for the research at hand. Just because a conceptual definition has been used does not make it the best conceptualization for every research application. Figure 4.5 offers an illustration of the conceptualization step.

Providing conceptual definitions is challenging. Yet, conceptualization is an important process, and a researcher must take the time to do it well. In the end, your research is only as good as its weakest element, and using poor conceptual definitions weakens the whole product. It also makes following steps in the research endeavor, including the next step of operationalization, more challenging. Having engaged in conceptualization, a researcher is one step closer to the next step: operationalization.



Must college students live on campus to be considered a college student? Do online students count? What of those taking a class at a nearby community college.

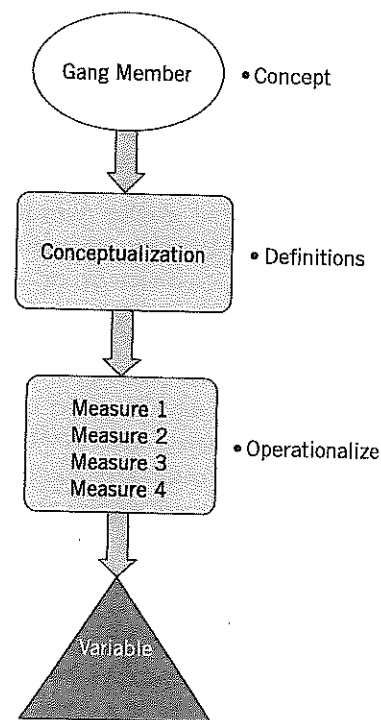
Figure 4.5 Conceptualization

What Is Operationalization?

For most planning on using quantitative data, the next step in the process is to specify exactly how you will measure the concept based on the conceptual definition. Identifying how you will measure each concept, being guided by the conceptual definition, is a process known as **operationalization**. Conceptualization focuses on developing specific definitions, operationalization focuses primarily on how a researcher will indirectly measure the concept. Although operationalization is engaged in primarily by researchers who will use quantitative data, researchers using qualitative data are interested operationalization in terms of how their respondents view the appropriate measurement of concepts. For instance, a respondent may note that they identify a bad police officer based on the way she drives or the language used. How respondents “measure” underlying concepts is of interest to researchers gathering qualitative data.

For researchers who will be using quantitative data, operationalization details the precise way in which they will measure the underlying concept. Will they use a survey question? Will they weigh something? Will they count something? Each of these are ways in which a researcher can operationalize a concept (or part of it). There are many ways to operationalize concepts, and the researcher must identify exactly how he or she will accomplish it.

Cuevas offers an excellent example regarding concepts and operationalization: someone says they are going to “travel to work.” The concept of “travel to work” has shared meaning among people. Yet Cuevas notes that “traveling to work” can be accomplished in many ways, by taking different modes of transportation, by using different pathways, and so on. Operationalization refers to the *specific way* that person will “travel to work” by



Research in Action

Victim Impact Statements, Victim Worth, and Juror Decision Making

The role of victims in crime has remained unchanged, but what has changed is the way victims have been included in the criminal justice system. One way victims have been included in the system is the use of a victim impact statement at trial. Although many view victim impact statements as a win for victims (and their families), others have expressed fear that victim impact statements will lead jurors to make decisions in part based on judgments about the worth of victims. In this way, some believe victim impact statements will introduce an element of unfairness in trials. Regardless, victim impact statements are now a part of trials, but the question remains: Does the victim's socioeconomic status influence juror decisions? Existing research offers mixed findings. Schweitzer and Nunez's (2017) research addresses this question using multiple facets of socioeconomic status.

The specific purpose of Schweitzer and Nunez's research was twofold:

1. To examine whether victim impact statements affect sentencing decisions
2. To examine whether victim socioeconomic status information conveyed through a victim impact statement might influence jurors' sentencing decisions in capital murder cases

To conduct this research, 249 people were gathered in a sample using an online survey tool that offers a low-cost sample of subjects (Amazon's® MTurk™). Each subject completed a death qualification questionnaire that included three items that assessed whether participants were willing to give the death penalty and whether they would give the death penalty no matter what the circumstances. Only subjects who noted that they would give the death penalty if the circumstances warranted it were eligible to participate in the study. All participants listened to 35 minutes of audio of the sentencing phase of a capital murder trial. The evidence against the defendant was extremely strong. Subjects were told that the defendant had been found guilty of first-degree murder and that it was their role to sentence him. The subjects also learned that the defendant had been

on parole when he committed the murder and that he murder had occurred with additional felonies. The next part of the study involved the victim impact statements being given by the daughter of the murder victim. The daughter was varied in two primary ways: socioeconomic status and language. In terms of socioeconomic status, the daughter giving the victim impact statement was varied in terms of occupation (saleswoman at, or manager of, a furniture store), housing (mobile home versus house), type of vacation taken (camping or cruise), daughter's education (not mentioned or PhD), and occupation (flight attendant or college professor). Verbally, the daughter used language in terms of using *eh* or *you know*, and dropping the *g* at the end of words (e.g., *I'm goin* to the store) or using phrases such as *I think* or *I suppose* and more adjectives.

To analyze the data, a logistic regression was used to isolate the influence of socioeconomic status on a juror's sentence. With regard to the first purpose, the findings showed that victim impact statements do not bias jurors. In addition, the examination of the second research purpose suggests that victim information, specifically socioeconomic status conveyed through the reading of a victim impact statement, did bias jurors' sentencing decisions. Specifically, when the daughter was of lower socioeconomic status, the defendant was less likely to be sentenced to death. Defendants killing a middle socioeconomic victim were more likely to be sentenced to death.

The policy implications of this research suggest that the socioeconomic status of those giving the victim impact statement influence jurors' sentencing decisions. Judges must be made aware of this when deciding which portions of the impact statement should be allowed. In addition, an obvious policy consequence is that the use of victim impact statements may be called into question if additional research shows they have a biasing effect on sentencing especially in capital murder cases.

Schweitzer, K., & Nunez, N. (2017). Victim impact statements: How victim social class affects juror decision making. *Violence and Victims*, 32(3), 521-532.

identifying the streets and roads she takes, every turn she makes, and the type of vehicle used, the speed traveled, and so on. Santos offers an excellent example in terms of the concept of security. One way a researcher may conceptualize security is by lighting in an area. Operationalizing it means addressing the question, "What does this conceptualization mean in terms of gathering data?" For example, would you gather data on how bright lights are? Or would you measure where the lights are located? Perhaps you would measure how many lights there are? Or maybe simply whether there are any lights? These practical questions must be clarified during operationalization, so the researcher knows exactly what type of data to gather.

Concepts can be operationalized in myriad ways, and it is up to the researcher to identify precisely the way they are operationalizing each concept. First, you must identify the nature of each measure used to represent the underlying concept of interest. Is it a survey question? A count? Observation of behavior? Second, you must determine how many measures are needed to best measure the underlying concept. Often a variable is based on a single measure, yet other times, multiple measures are used. Zaykowski notes that in general, it is better to use multiple operationalizations because they can better capture the richness of underlying concepts. In the case of Zaykowski's (2014) featured research using the National Crime Victimization Survey (NCVS), she is constrained by the operationalizations available in these existing data (aka secondary data). Cuevas's work offers a great example of the use of multiple operationalizations for each concept to better capture concepts such as culture or victimization (Sabina et al., 2016). For instance, in Cuevas' study, the concept of victimization was operationalized by the use of the modified juvenile victimization questionnaire (JVC). The JVC gathers data on conventional crime, peer and sibling victimization, child maltreatment, and sexual victimization within the past year. There are 17 questions asked of respondents to see whether they had been victimized in the last year. If so, additional data are gathered on each attack such as whether the relationship to the perpetrator. Using 17 questions to get at a single concept offers a robustness to that operationalization. A third consideration is that you must identify the nature of how the data for each operationalization will be recorded. Will you note the presence or absence of the concept of interest? Or count how many times someone is victimized? Exactly what type of data will be recorded is an important consideration in operationalization. Once operationalization is concluded, the researcher will be working with variables. Therefore, the chapter now turns to variables, what they are, and how they are constructed.

Variable: Labels applied to measures used to represent the concepts of interest. Variables act as proxies for the abstract concepts they represent.



What Are Variables?

Variables are the labels for the observable and measureable counterparts of concepts. Variables act as proxies of the abstract concepts they represent. A researcher studies variables to understand the concepts, and a researcher investigates the relationship among variables to understand the relationship among concepts. This is possible because variables represent the observable measures used to gather data.

Variables are categorized based on the nature of the data collected. Before discussing the many types of variables, it is instructive to return to the research questions to better understand variables.

Revisiting Research Questions With a Focus on Variation

Recall that research questions guide the entire research enterprise. They are the question a researcher seeks to answer. Consider these research questions/objectives from some of our case studies:



Melde and collaborators (Melde et al., 2009): (a) What is the effect of gang membership on self-reported victimization? (b) What is the effect of gang membership on perceptions of victimization risk? (c) What is the effect of gang membership on the fear of victimization?

Brunson and colleague (Brunson & Weitzer, 2009): What are differences in views of police relations of Black and White youth based on where they reside: a Black disadvantaged neighborhood, a White disadvantaged neighborhood, or a racially mixed disadvantaged neighborhood?

For Melde, the concepts in his research questions indicate what he will gather data about. In contrast, Brunson's exploration, identifying and comparing concepts of interest within these three neighborhoods, is the goal of the research. Research seeks to identify or understand the importance of concepts, including relationships among concepts. Yet, the interest goes much deeper than that. Researchers are fundamentally interested in the *variation* in these concepts and in how the *variation* in one concept influences or is associated with the *variation* in another concept. For example, researchers are not interested in victimization per se; researchers are interested in variation in victimization experiences among those in the public. Why are some people victimized and others are not? Researchers are not interested in perceptions of the police per se; they are interested in variation in perceptions of police among Black and White youth.

Why place emphasis on variation? Variation is a fundamental element of research. The presence of variation can be used to establish a relationship among concepts. If concepts vary together, a researcher has evidence that the concepts may be related. If the concepts do not vary together, a researcher does not have evidence of a relationship among them. Because all people reside on planet Earth (to our best knowledge), it would not make sense to propose research asking whether the planet of one's residence is related to attitudes about police. Why? Because everyone lives on Earth, planet of residence is a constant and therefore cannot possibly account for any variation in attitudes toward police. If everyone has the same level of education, it would not make sense to study whether educational level is related to income. Why? Because educational level is a constant, meaning it cannot influence the variation in people's income. Given this newly identified emphasis on variation in and among concepts, it is useful to consider some research questions and what they really are asking.

Research question: Zaykowski (2014) asks: How does reporting to the police, the victim's demographic characteristics, the victim's injury, offender's use of a weapon, the victim's relationship to the offender, and the victim's mental and physical distress influence victim service use?

What is really being asked: How does variation in whether victims report to the police, variation in victims' demographic characteristics, variation in whether victims were injured, variation in whether offenders used a weapon, variation in victim-offender relationships, and variation in victims' mental and physical distress influence variation in seeking victim services?

Research question: Cuevas and colleagues (Sabina et al., 2016) ask: (a) What are the rates of dating violence by victim gender? (b) What is the risk of experiencing dating violence over time? (c) Is dating violence victimization associated with other forms of victimization? (d) What cultural factors (e.g., immigrant status, familial support) are associated with dating violence over time?

What is really being asked: (a) How do the rates of dating violence vary by whether a victim is male or female? (b) Does the risk of experiencing dating violence vary over time? (c) Is variation in dating violence victimization associated with variation in other forms of victimization? (d) Is variation in peoples' cultural factors (e.g., immigrant status, familial support) associated with variation in the amount of dating violence experienced over time?

Research question: Melde and collaborators (Melde et al., 2009) ask: (a) What is the effect of gang membership on self-reported victimization? (b) What is the effect of gang membership on perceptions of victimization risk? (c) What is the effect of gang membership on the fear of victimization?

What is really being asked: (a) How does variation in whether one is a gang member or not affect variation in amount of self-reported victimization? (b) How does variation in whether one is a gang member or not affect variation in perceptions of victimization risk reported? (c) How does variation in whether one is a gang member or not influence variation in level fear of victimization expressed?

Research question: Brunson and his collaborator (Brunson & Weitzer, 2009) ask: What are differences in views of police relations of Black and White youth based on where they reside: a Black disadvantaged neighborhood, a White disadvantaged neighborhood, or a racially mixed disadvantaged neighborhood?

What is really being asked: How do the views of police relations among Black and White youths vary based on variation in neighborhood where they reside (a Black disadvantaged neighborhood, a White disadvantaged neighborhood, or a racially mixed disadvantaged neighborhood)?



Dependent variable: Type of variable that is the outcome of interest and focus of the research.

Type of Variables: Dependent, Independent, and Control Variables

In general, three specific categories of variables are used in research: dependent variables, independent variables, and control variables.

Dependent Variables

Dependent variables are variables that are the focus of the research. Dependent variables represent the outcome of interest. It is variation in the dependent variable that many researchers using quantitative data are most interested in understanding. The basic question, "What causes the variation observed in the dependent variable?" drives a great deal of research using quantitative data. Because understanding the variation in a dependent variable (also referred to as DV) is an ultimate focus of this type research, it is also the primary focus in the literature review (refer back to Chapter 2). Let's consider the following hypothetical research questions.

Research question: Is educational attainment associated with recidivism?

In this example, the researcher seeks to understand what leads to or causes variation in recidivism (shown in the circle in Figure 4.6). In particular, the researcher asks what role variation in education level has on the variation in recidivism. This is illustrated in Figure 4.6.

In this depiction, the arrow indicates the direction of influence, and it always points to the outcome or the dependent variable. Notice how the researcher is *not* interested in what leads to variation in education level? Educational level is not the focus of this research.

This next example comes from the work of Zaykowski (2014). What is the dependent variable in this research?

Research question: How does reporting to the police, the victim's demographic characteristics, the victim's injury, offender's use of a weapon, the victim's relationship to the offender, and the victim's mental and physical distress influence the use of victim services?



Figure 4.6 Effect Education Level Has on Recidivism

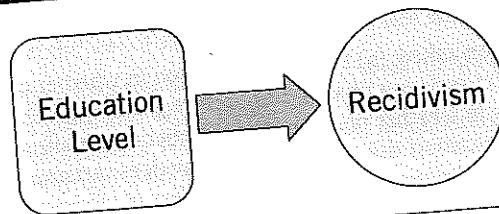
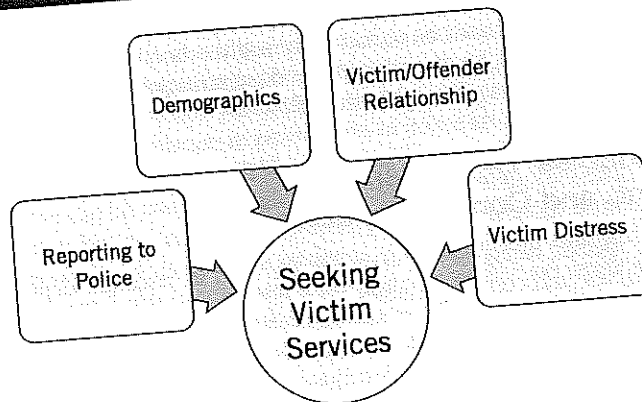


Figure 4.7 Zaykowski's (2014) Research Question Illustrated



Independent variable:
Type of variable that is believed or hypothesized to influence, be associated with, or cause the variation in an outcome or dependent variable.

The dependent variable, or outcome of interest, in Zaykowski's (2014) work is variation in seeking victim services (shown in the circle in Figure 4.7). That is, as the arrows indicate, she wishes to understand what influences whether victims seek services. In particular, she focuses on how variation in reporting to police, demographics, victim-offender relationship, and victim distress influence whether a victim seeks out victim services. Zaykowski is not interested in understanding why reporting to police, demographics, victim-offender relationship, and victim distress vary, only in why seeking services varies. Zaykowski's research question is illustrated in Figure 4.7.

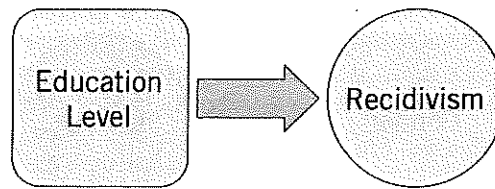
Note that the arrows in Figure 4.7 point to the outcome or the dependent variable. You might be wondering, what are these other variables such as victim distress or demographics if they are not dependent variables? What role do they play? Variables in this role are independent variables.

Independent Variables

Independent variables are variables thought to influence, be associated with, or cause the variation in an outcome or a dependent variable. The purpose of research is not to understand what causes variation in independent variables (also referred to as IVs). Rather, the purpose of research is to understand whether and how an independent variable is related to or causes the variation in the dependent variable.

What are the independent variables in the two examples? In the first example, focused on education level and recidivism, the independent variable is education level (shown as

Figure 4.8 Effect Education Level Has on Recidivism



a square in Figure 4.8). This illustration indicates that the research seeks to understand or identify how variation in educational level (IV) influences, or is associated with, variation in recidivism (DV).

In the second example focused on victim services, Zaykowski identifies multiple independent variables including reporting to police, demographics, victim-offender relationship, and victim distress. These are shown in the squares in Figure 4.9.

Some researchers do not distinguish variables beyond independent and dependent variables. To those individuals, anything but the dependent variable is an independent variable. Nevertheless, it is common among criminal justice and criminology researchers to refer to a third category of variable: a control variable.

Control Variables

Control variables are a type of independent variable included in research to better highlight the role of an independent variable of interest. Control variables are also referred to as CVs. A research goal is often to understand the influence of the IV on the DV. For example, does (variation in) gender influence (variation in) income? In the example shown in Figure 4.10, the dependent variable is income, and the independent variable is gender.

Assume that based on this question, you gathered data of gender and income among a group of people, analyzed those data, and found that gender is related to income, and specifically that being male is associated with higher incomes. The work is published, but shortly after, the findings are criticized in this way: "This finding is meaningless because



Control variable: Type of independent variable included in research to better isolate the role of an independent variable of interest (frequently referred to as CVs).

Figure 4.9 Focus on Zaykowski's (2014) Independent Variables

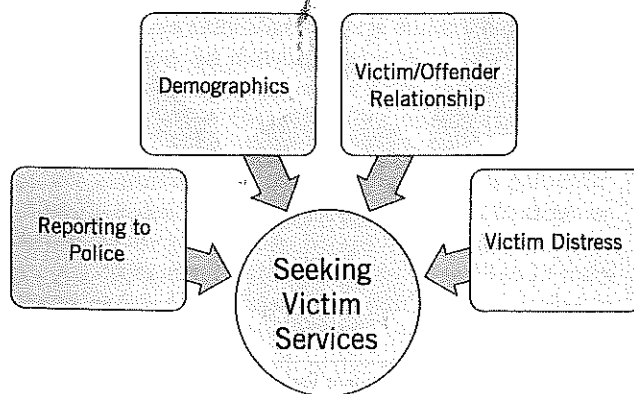
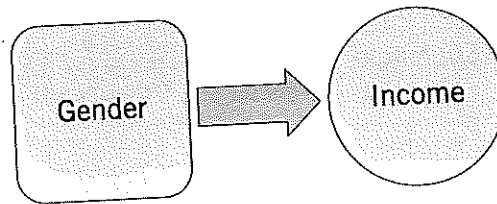


Figure 4.10 Illustration of Income as Dependent Variable and Gender as Independent Variable

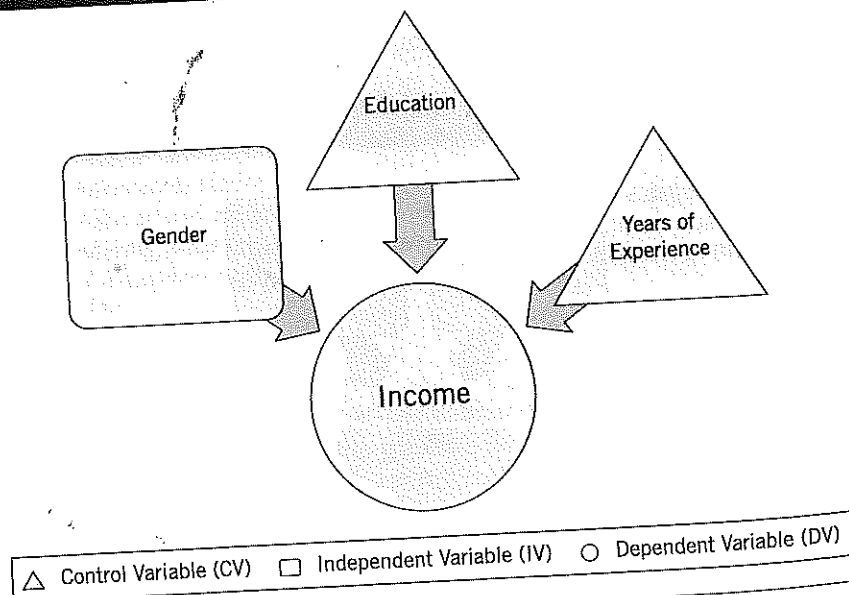


the researcher failed to consider, or take into account, educational attainment and years of experience in careers when conducting this analysis. Earlier research finds evidence that educational attainment and years of experience are related to gender and income. Without controlling for the influence of education or years of experience on income, this work cannot conclude the role that gender has on income."

This criticism indicates that to truly understand whether and how gender influences income, you must take into account—or control for—educational attainment and years of experience. By controlling for educational attainment and years of experience, you can better isolate the effect of gender on income (which is the purpose of the initial research). Consider the revised research question illustration in Figure 4.11.

The two control variables are shown as triangles. Analytically, independent and control variables are treated the same. The only difference in these variables is how the researcher labels and discusses them. Given the updated research question based on the illustration in Figure 4.11, you might still find that gender is related to income, and specifically that being male is associated with a higher income. Given the inclusion of control variables, however, the conclusion would be stated as "Gender is associated with income, even after taking into account—or controlling for—educational levels and experience in the field."

Figure 4.11 Focus on Control Variables



Memorizing IVs, DVs, or CVs—It Doesn't Work

Students frequently struggle with identifying variables as IVs, DVs, or CVs. A commonly attempted (but ill-fated) strategy is to try to memorize all independent, dependent, and control variables. Although seemingly a clever idea, this approach does not work. Why? Because a variable's role is dependent on the specific research in which it is found. For example, a variable such as income may serve as a dependent variable in one piece of research, may be an independent variable in some other research, and be a control variable in yet other research. Consider the three research examples in Figure 4.12.

In the first example, the researcher is focused on understanding the role of gender (IV) on income (DV), controlling for education and years of experience (CVs). In the second example, the researcher is focused on understanding the role of income (IV) on education (DV), controlling for gender and years of experience (CVs). Finally, the third researcher considers the role of education (IV) on years of experience (DV), controlling for income and gender (CVs). The role each variable plays is contingent on the research question of interest.



Measure: Tools used to gather data that represent an abstract underlying concept. Data are gathered in the same way some tools in a garage are used.

What Are Measures?

During operationalization, the researcher identifies the specific measure or measures used to measure the underlying concept. A measure is a tool used to gather data to represent an abstract underlying concept. Measures used in research are tools used in the same way some tools in a garage are used. You may use a measuring tape to gather data (i.e., how long something is) to represent an abstract concept (i.e., length). Alternatively, you might use a scale as a tool to measure the underlying concept of heaviness. Measures in research operate the same in that they are used to gather data to represent the underlying concept.

Measures can take many forms that must be identified during operationalization. For example, you might construct a survey with ten measures—or ten questions—on it. Or you might measure how often children act violently toward one another using observations as a measure. Or you might use questions during an interview as a tool to measure some underlying concept. You may use existing measures used by others found in the literature, or you may create your own. The following sections offer some examples of possible measures you can use during the operationalization of concepts.

Example: Measuring College Student

There are numerous ways to operationalize a college student based on the following conceptual definition: an individual who is 18 to 24 years of age, who has attended a university either online or in person, public or private, within the last six months. One option for operationalization is to gather data from all universities in the United States (i.e., online, in person, public, private, community college, four-year, etc.). In particular, by using those university records, you could identify current students or those who had attended in the previous six months from registrar records. With those records, you could identify individuals who were 18 to 24 years of age when they were enrolled in college. This would result in a plan to use a single measure, which would ultimately be used to gather data on this concept. A limitation of this approach is that universities could not reveal these data, given federal restrictions, unless every student provided permission to do so.

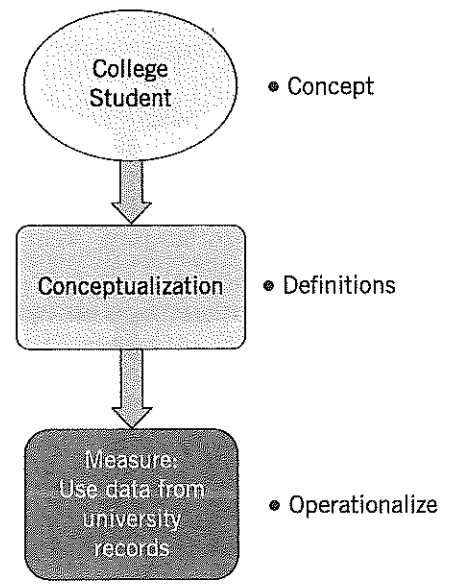
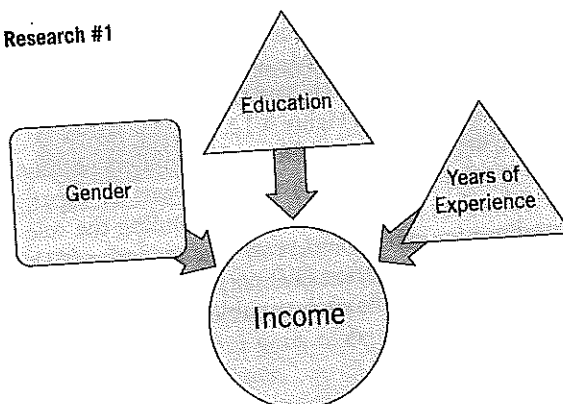
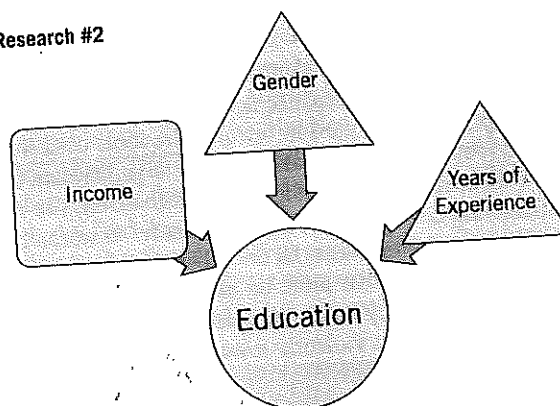


Figure 4.12 Considering Different Research Questions Using the Same Variables

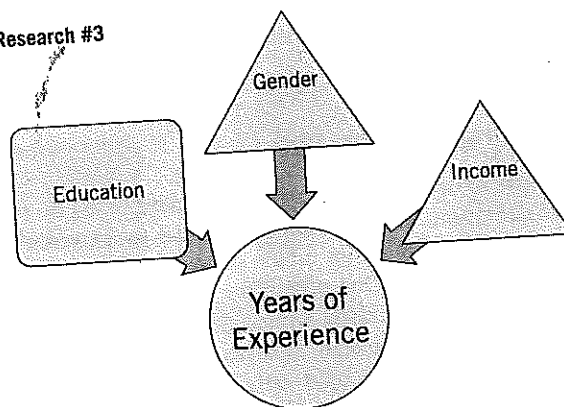
Research #1



Research #2



Research #3



△ Control Variable (CV) □ Independent Variable (IV) ○ Dependent Variable (DV)

A second possible operationalization of college student (based on the conceptual definition) would be to conduct a survey of people in the United States. In that survey, you would include survey questions about the respondent's age, if he or she is currently enrolled in a college or university, or if the respondent was enrolled in a college or university in the last six months. Like all operationalization, this approach has some limitations. First, it can be expensive to conduct a national survey with enough respondents needed for an adequate amount of data. Second, it is especially challenging because those aged 18 to 24 make up a small proportion of the population, meaning you would need to make many calls before finding someone in the required age range.

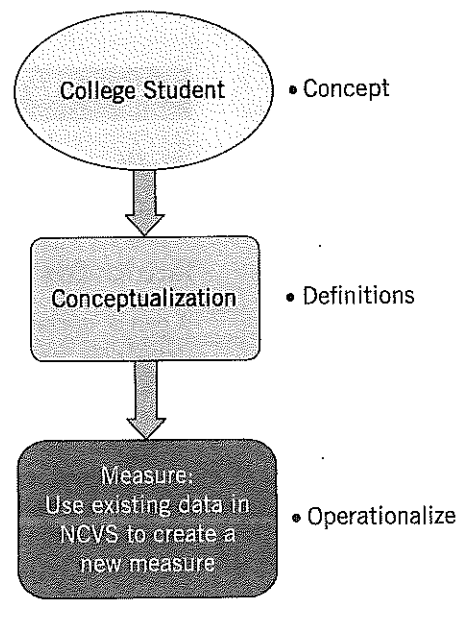
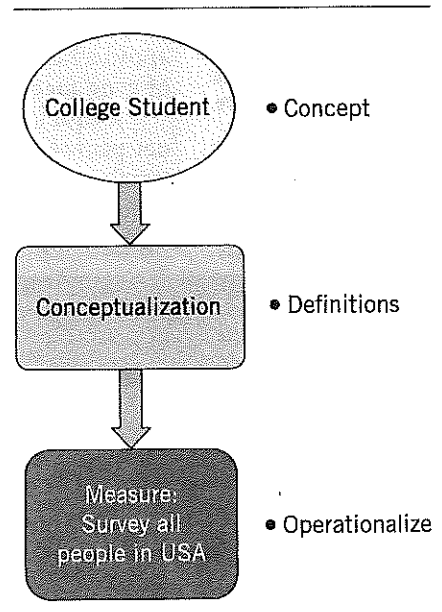
A third operationalization option of college student is to use data that have already been gathered and available. For example, you could operationalize college student using data collected and available in the NCVS. The NCVS gathers data from individuals, 18 to 24 years of age, who have attended a college or a university in the prior six months. This operationalization and available measures align well with the conceptual definition.

How Many Measures?

You could use a single measure or multiple measures to gather data that capture the meaning of an underlying concept. All else being equal, the use of multiple measures is advantageous. Why? Because in most cases, the full meaning of an underlying concept cannot be captured using one measure. Some concepts are complex enough that you *must* use multiple measures to as comprehensively as possible measure all dimensions of that concept. Take for example the idea of culture used in Cuevas's work (Sabina et al., 2016). One survey question would not comprehensively capture the meaning of culture. As a result, Cuevas and his team used multiple measures. Some researchers, especially those using existing data, may be constrained because of the availability of only one measure. For Zaykowski (2014), this meant that measuring the concept of victim services was limited to using a single question or measure to reflect that concept.

As an example, how might you measure the concept of a gang member? The conceptual definition of gang member for the purposes of this example is a person who is actively involved in a street gang, and is recognized by members of the gang as a member. How might you operationalize this? One option is to ask individuals whether they are gang members. This is simple and elegant, and is the approach used by Melde and colleagues (2009). Nevertheless, research shows that this approach may lead to false positives as many wannabe gang members claim membership when they actually are not gang members.

A second option is to ask known gang members who other gang members are. This is also simple and elegant, but it can be problematic if that gang member does not know all other members. A third approach could be to ask law enforcement who the known gang members are. This too is imperfect as law enforcement may only know of gang members who have tangled with the law. And a fourth way might be to identify gang members via observation of tattoos or articles of clothing depicting their membership. Again, this is not a perfect approach, but it should



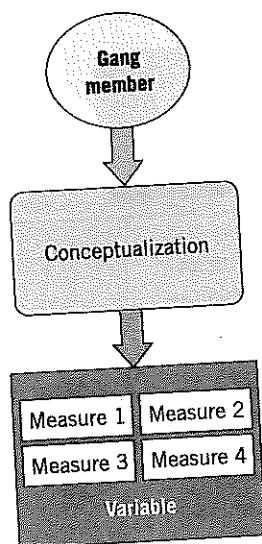
Attributes: Categories or grouping of the data collected for a particular measure.

Response categories: List of options available from which a respondent selects an answer.

identify those showing this sign. This example demonstrates that any one of these approaches measures some, but misses other, elements of, the underlying concept of gang membership.

A fifth approach of measuring gang membership is to use multiple measures. Why not plan to use all four of these questions to measure the underlying concept of gang membership? You could operationalize gang membership such that an individual must be identified as a gang member for at least two of the four approaches to be considered a gang member. This offers an improved measurement of the concept. Figure 4.13 illustrates how operationalization may lead to the plan to use multiple measures to best measure a single concept.

Figure 4.13 Operationalization Using Multiple Measures



What Are Data?

Throughout the chapter, we have relied on a general understanding about the meaning of data. Let's now offer a more specific definition of data. Data are the individual pieces of information—numeric or non-numeric—gathered and later analyzed to answer a research question. The word *data* is plural; *datum* is singular, therefore a researcher states that "data are" or "data were" rather than "data is" or "data was." As previously noted, data should vary to be useful in research. Consider the concept "Trust in Law Enforcement." To measure this, 16 people were asked whether they had contacted the police after a property or a violent crime in their lifetime. The data gathered are recorded in Table 4.1. The variable name used to reflect that measure is "Reporting to Police."

Notice how these data (yes/no responses) vary. Among the 16 individuals interviewed, 10 stated they had reported the victimization to the police. Notice also that in this case, the variable and the concept it represents do not share the same name. The concept is "trust in law enforcement," and the variable name is "reporting to police." In other cases, concepts and variables share the same name.

Table 4.1 Data for "Reporting to the Police" Variable

yes	yes	no	yes	no	yes	yes	yes
no	no	yes	yes	yes	no	yes	no

Attributes

A part of operationalization when one is gathering quantitative data is to identify the categories of data that will be gathered. The chapter has made clear that data must vary. The nature of the variation is determined by the attributes of the measures. **Attributes** are the categories of the data collected. These are also known as **response categories**. Examples of attributes make this concept clearer.

Imagine that a researcher has decided to conduct research on parolees. As a part of that research, the researcher is interested in the age of the parolee. During the operationalization stage of the research, the researcher identifies a variable named "age" and is trying to figure out what attributes or response categories he will use. One option is to use two attributes for the variable age: "juvenile" and "adult." Let's assume the researcher is using a survey administered to a group of parolees. On that survey, the age measure used to gather data on age may look like this:

What is your age?

- ☐ Juvenile
- ☐ Adult

Attributes/Response Categories

In this example, there are two response categories: juvenile and adult. A second option is to collect the data for parolee's age in this way:

What is your age?

- ☐ under age 10
- ☐ age 10 to 19
- ☐ age 20 to 29
- ☐ age 30 to 39
- ☐ age 40 to 49
- ☐ age 50 to 59
- ☐ age 60 to 69
- ☐ age 70 to 79
- ☐ age 80 to 89
- ☐ age 90 or greater

Attributes/
Response
Categories

In this second example, there are ten attributes or response categories from which the parolee can choose. A third option is to gather data on parolee age in this way:

Your (the parolee) age in years? _____

Attributes/Response
Categories (implied
from 0 to infinity)

Another example involves a researcher operationalizing "weapon presence" during a violent crime. By using a variable called "weapon," the researcher has countless options in terms of attributes to represent weapon presence. One approach is

Was the offender(s) armed with a weapon?

- ☐ Yes, weapon present
- ☐ No weapon was present
- ☐ Don't know the type of weapon used

Attributes/Response Categories

Or a greater number of attributes or response categories for collecting data on weapon presence is an option:

Mutually exclusive:
Measurement requirement
that the attributes offered
must not overlap in
meaning.

Exhaustiveness:
Measurement requirement
that there be an attribute
available for every
possible response.

What type of weapon did the offender(s) brandish?

- ☐ No weapon present
- ☐ Firearm
- ☐ Knife or cutting implement
- ☐ Blunt object
- ☐ Other type of weapon
- ☐ Don't know the type of weapon used

Attributes/Response
Categories

How do you know what the best attributes or response categories to use are? First, you must use enough options to allow every possible option for the question asked. Second, a variable's response categories or attributes must be different from one another so as to make clear which attribute is best for respondents to check. And third, you should gather the most data possible and practical. In other words, you need to pay attention to exhaustiveness, mutual exclusiveness, and levels of measurement. Each of these is discussed next.

Mutual Exclusiveness and Exhaustiveness

Certain considerations should be taken into account when selecting or identifying response categories. In situations in which only one attribute is to be selected by respondents, attributes should be mutually exclusive. **Mutually exclusive** means that the attributes offered do not overlap in meaning. A respondent should not struggle to understand which option fits. For example, consider these response categories for identifying marital status:

What best describes your current marital status (please select only one)?

- ☐ Single
- ☐ Divorced
- ☐ Separated
- ☐ Widowed
- ☐ Married

Attributes/Response Categories – not
mutually exclusive

These attributes are not mutually exclusive. Why? Because a person can be single and divorced. In addition, a person can be married and separated. Without clear attributes to guide data collection, the resulting data will be fouled up. Consider these small changes to make these attributes mutually exclusive.

What best describes your current marital status (please select only one)?

- ☐ Never married
- ☐ Divorced
- ☐ Married, but separated
- ☐ Married, not separated
- ☐ Widowed

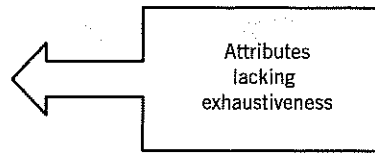
Mutually Exclusive Attributes

Given this change in attributes, a researcher can better gather data that accurately measure the variable (and underlying concept) of interest.

Another important characteristic for attributes is exhaustiveness. **Exhaustiveness** is the requirement that there be an attribute or response category for every possible response. This is illustrated with marital status again:

What best describes your current marital status (please select only one)?

- ☐ Never Married
- ☐ Divorced
- ☐ Separated
- ☐ Widowed



In this example, a person who is married has no box to check. This list is not exhaustive. One way to ensure attributes are always **exhaustive** is to include an option such as the "other, please specify: _____" option. In this way, a full accounting of attributes can be gathered and good measurement is maximized.

Levels of Measurement

When using a research approach requiring quantitative data, a third important consideration in selecting attributes during operationalization is level of measurement. **Level of measurement** refers to the nature of the data gathered for a particular variable. Although multiple levels of measurement schemes are available, Stevens (1946) proposed a scheme that is widely used. This approach identifies four levels of measurement: nominal, ordinal, interval, and ratio. These levels are listed in an order of less information (nominal) to more information (ratio). You should strive to gather data offering the most information possible when you have a choice.

An easy way to remember the four levels of measurement is to remember the word "NOIR" (which translates to "black" in French). NOIR is an acronym comprising the first letter of each level of measurement (see Table 4.2). Each level of measurement is distinguished based on the presence or absence of these characteristics: ability to order attributes, equal distance between the ordered attributes, and, finally, presence or absence of a meaningful zero.

Nominal. Nominal measurement refers to attributes or response categories that differ in name only. Measurement of attributes at the nominal level has no inherent ordering between named categories or attributes, and the categories cannot be placed on a continuum with a meaningful zero. Because this measurement is only based on different categories, it is also referred to as a **categorical variable**. For example, consider the variable "type of violence" and these attributes: violent crime, and property crime. Two categories of type of crime have no inherent ordering and no meaningful zero. Another example is sex with the following attributes: female, male, other. Again, there is no ordering of these categories, and there is no meaningful zero. Many variables can only be measured at the nominal level including party identification, type of advocate, religious affiliation, types of rocks, and gender identity. If a variable can use attributes that can be measured at a higher level of measurement than nominal, it is recommended that you do so.

Ordinal. Ordinal measurement refers to named attributes of a variable that have an inherent order to them. In other words, ordinal refers to a level of measurement in which attributes can be rank-ordered. Variables measured using ordinal measurement indicate that the size between the categories is unknown and not equal. In addition, ordinal measurement is not associated with a meaningful zero. An example of ordinal measurement is class level at a university: freshman, sophomore, junior, or senior. These four categories represent four attributes that can be ordered from less to more university education. Nevertheless, you cannot state that the difference between a freshman and a sophomore is known or the same as the difference



Exhaustive: Desirable characteristic in response categories meaning every possible response option is offered.

Level of measurement: Nature of the data gathered for a particular variable.

Nominal: Level of measurement that indicates attributes or categories differ in name only. Nominal levels of measurement have inherent ordering between named categories or attributes, and the categories cannot be placed on a continuum with a meaningful zero. Variables with nominal levels of measurement are frequently called "categorical variables."

Categorical variable: Variables characterized by a nominal level of measurement.

Ordinal: Level of measurement that indicates that attributes of a measure have an inherent order to them. A level of measurement in which attributes can be rank-ordered.

Likert-type scale:
Commonly used measurement approach in which the response format includes ordered attributes such as "very unsatisfied," "unsatisfied," "satisfied," and "very satisfied."

Interval: Level of measurement that indicates that attributes of a measure can be rank-ordered and have known and equal differences between categories. Interval-level measures do not have a meaningful zero.

Ratio: Level of measurement that indicates that attributes of a measure can be rank-ordered, have known and equal differences between categories, and be nonarbitrary and meaningful zero. Any measure gathering count data is ratio in nature.

Table 4.2 NOIR

		EXAMPLES
Nominal Data	Categories (no ordering or direction)	marital status, race of victim, state of residence, type of court, type of violence, type of weapon
Ordinal Data	Ordered Categories (rankings, order, or scaling)	university level (e.g., freshman, sophomore, etc.), levels of satisfaction (e.g., not satisfied to satisfied)
Interval Data	Equal differences between measurements but no true zero	temperature (e.g., Fahrenheit or Celsius), hours on a clock, IQ, GPA
Ratio Data	Equal differences between measurements, true zero exists	age, number of years in prison, years of education, annual household income, number of victimizations experienced

between a sophomore and a junior, or between a junior and a senior. In other words, the distance between these ordered categories is neither clear nor equal. A widely used ordinal level of measurement are **Likert-type scales**. A Likert-type scale offers an ordered response format including attributes such as "very unsatisfied," "unsatisfied," "satisfied," and "very satisfied" to gather data on a variable. These attributes are ordered from least-to-most satisfied, yet you cannot know the difference between "very unsatisfied" and "satisfied" and whether this difference is equal to the difference between "unsatisfied" and "satisfied." There has been a long-standing controversy in the literature about the level of measurement of Likert-type scales as many use them as though they generate interval-level data. If you find that the difference or distance between each ordered category is known and equal, then they are working with interval-level measurement.

Interval. Interval level of measurement represents measurement of categories that can be rank-ordered and have known and equal differences between categories. These attributes, however, are not associated with a meaningful zero. A widely used example is the Celsius temperature scale. The distance between each degree on the scale is the same regardless of whether you are considering difference between 10 and 11 degrees or the difference between 45 and 46 degrees. Although this example has a zero value, it is an arbitrary point (i.e., zero degrees Celsius does not mean the "absence" of temperature measured on the Celsius scale), and you can use attributes below the zero mark in meaningful ways. For example, the difference between -3 and -4 degrees and between 18 and 19 degrees is equal. If you are using a scale with all the characteristics of an interval scale, but it also has a meaningful zero (i.e., the values lower than zero are not plausible), you are working with a ratio level of measurement.

Ratio. Ratio level of measurement has all the characteristics of levels of measurement described; plus, it has a nonarbitrary and meaningful zero. Many variables use ratio level of measurement in criminology and criminal justice research. In fact, any variable that is based on count data is ratio in nature. For example, asking how many victimizations a person experienced, how many children someone has, how many years were served in prison, and how many dollars' worth of goods were taken in a burglary all represent ratio levels of measurement. Zero is

meaningful and nonarbitrary in that a person cannot have -4 victimization, -2 children, -13 years in prison, and -\$3,499 worth of property taken during a burglary.

Collect Data at the Highest Level of Measurement Possible

A researcher should always strive to gather data at the highest level of measurement possible and practical. The level of measurement of variables determines the types of statistical techniques a researcher can use to analyze the data. Certain levels of measurement for a dependent variable determine which type of analysis you can use. Certain levels of measurement allow you to calculate a mean (e.g., average age; mean number of years of education), whereas other levels of measurement disallow it. You can always take data gathered at a higher level of measurement and collapse it to a lower level of measurement. On the other hand, you can never take a lower level of measurement and convert it to a higher level of measurement. Santos notes, "If you have a ratio level variable, you can do anything with it. You can always aggregate it to lower levels of measurement such as nominal or ordinal. However, you can never take nominal level data and convert it to ratio level. A researcher should develop their variables such that they get the maximal information and that is done by using ratio level data when possible."

Discrete and Continuous Variables

Another way a researcher might characterize a variable is as discrete or continuous. **Discrete variables** are measured using whole numbers only. Examples include number of offenders or bystanders. A person may have been assaulted by 1, 2, 3, 99, or 1,349 offenders in the presence of 1, 2, 3, or 199 bystanders. People cannot be assaulted by 1.37 offenders when 13.2 bystanders are present. Discrete variables differ from categorical in that it is a numerical measurement (e.g., number of times to prison), whereas categorical offers named measurement (e.g., offender). **Continuous variables** also use numerical measurement; nevertheless, the numerical measurement is not restricted to whole numbers. For example, weight in pounds may lead to responses such as 102.7 lbs, or 115.27 lbs, or 198.4582 lbs. A person could continue measuring this continuous variable if he or she had tools precise enough to add additional decimal points. These characteristics are important during data analysis because they indicate the analytic techniques a researcher can and cannot use.

The Role of Validity

This chapter has focused on the steps taken to move from abstract concepts to variables. A goal of these steps is for the measures and variables to correspond as accurately as possible to the underlying concepts they represent. An accurate measurement of the concept by the measures is associated with **validity**. Stated simply, in the general context of research, if a measure measures what it claims to measure, it is a valid measure. Measurement isn't precise. As Bollen (1989) indicated, validity can never be fully established, but researchers can provide evidence of the validity of any measure. That evidence can be gathered in several ways, as discussed next.

Face Validity

There are many specific types of validity researchers consider (more than will be covered here). The easiest to understand is face validity. Face validity indicates that a measure appears to measure the concept it is designed to measure. For example, if you are interested in measuring the concept of "age," you might ask individuals what their current age in years is. On its

Discrete variable:
Additional way to describe interval- and ratio-level variables. These variables use numeric measurement and are restricted to only whole numbers.

Continuous variable:
Additional way to describe a ratio or interval level of measurement. Continuous variables use numerical measurement and are not restricted to whole numbers. That is, they can be expressed using decimals (e.g., 1.3, 27.85, 1,079.453).



Validity: Sought-after characteristics in research that indicate that one's measures and variables correspond as accurately as possible to the underlying concepts they represent.

Face validity: Type of validity that indicates a measure *appears* to measure the concept it is designed to measure.

Content validity: Type of validity established when a measure captures the meaning of the abstract concept based on the conceptual definition.

Criterion validity: Type of validity established when one's measures correspond to existing measures (aka criteria).

Reliability: Identifies the quality of measurement taken across a group of subjects in terms of whether a measure provides consistent measurement over repeated administrations (assuming no real change has occurred).

Inter-rater reliability: Way to establish the presence or absence of reliability by measuring the degree to which different raters or observers offer consistent assessments of the same phenomenon.

face, most would agree that this measure appears to be a valid measure. What if, instead, that same researcher asked individuals their horoscope sign to measure age? Most would agree this measure lacks face validity. Face validity is the crudest, simplest, easiest, and most subjective validity to establish. In reality, the measure may or may not accurately measure the concept of interest, but as long as it *appears* to do so, the measure has face validity.

Content Validity

A second type of validity is content validity. **Content validity** refers to whether the measures of a variable capture the meaning of the abstract concept given the conceptual definition. Suppose the concept of interest is "cybercrime" and a researcher defined it as "[a] crime in which a computer is the object of the crime (hacking, phishing, spamming) or is used as a tool to commit an offense (child pornography, hate crimes)" (Techopedia, 2017). To measure cybercrime offenses, a researcher develops a single measure used on a survey of individuals that asks, "Have you ever hacked someone else?" Given the conceptual definition offered, you can argue convincingly that this measure lacks content validity. Why? Because that particular measure only captures a small part of the conceptual definition. If someone answered "no" to that single measure, it only means he or she had not hacked someone else. The person may have phished, spammed, committed online hate crimes, or viewed, created, or distributed child pornography. To properly measure the full domain of cybercrime as defined, you would need multiple measures to do so. Bollen (1989) contended that the two primary ways to assess the presence of content validity are by using multiple measures and by consulting experts.

Criterion Validity

A third type of validity is criterion validity. **Criterion validity** is established when a measure corresponds to existing measures (aka criteria). For instance, imagine a researcher has a measure to ascertain whether someone experienced violent victimization that was reported to the police. Now imagine that the researcher has access to all police records to see whether those individuals actually did report the violence to the police. If there is a large degree of correspondence, the measure can be said to have criterion validity.

The Role of Reliability

Another attractive measurement quality is reliability. **Reliability** refers to whether the measure provides consistent measurement over repeated administrations (assuming no real change has occurred in the thing being measured). Reliability does not reflect the quality of a measure (it may be terrible); rather, it refers to the repeatability of the measure. Reliability should not be used to describe the value of a measure based on measurement of a single individual (or unit observed or measured). Rather, reliability is used to describe the quality of measurement taken across a group of individuals (or units observed or described).

A simple example of reliability involves a weight scale. Assume you needed to calculate the average or mean weight of all students in a classroom. The measurement tool you select is a weight scale. The average weight is calculated to be 130 lbs. Then that scale was used to calculate the average weight again. If the scale was reliable, you should expect that the average weight of the students is about 130 lbs. What if it is 178 lbs instead? And then 210 lbs? Then 120 lbs? That would be an unreliable measure.

Like validity, it is not possible to establish reliability with certainty; you can estimate it, however. Although the precise ways to estimate reliability are beyond the material presented here, the following discussion provides ways to think about it. **Inter-rater reliability** is

the degree to which different raters or observers offer consistent assessments of the same phenomenon. Stated differently, inter-rater reliability is the degree of agreement between two raters examining the same phenomenon. The degree of agreement is the degree of reliability. A second type of reliability suitable for some types of measures is test-retest reliability. Evidence of test-retest reliability is found when the same measure, administered repeatedly, offers similar results (assuming no real change has occurred that would lead to different values from the second test). The weight example described earlier uses test-retest reliability.

Test-retest reliability: Way to establish the presence or absence of reliability by using the same measure repeatedly over time.

Reliability and Validity—Don't Necessarily Exist Together

Reliability and validity both focus on the quality and accuracy of measurement. Validity focuses on the measurement from abstract in-your-mind concept to the real-world, observable measure, whereas reliability focuses on the measurement that considers measurement quality of the same tool over time (see Table 4.3). Just because a measurement tool is valid does not mean it is reliable. Similarly, a measure that is reliable is not necessarily valid.



Table 4.3 Relationship Between Reliability and Validity

Validity	Reliability	
	Valid, and reliable	Not valid, although reliable
	Valid, not reliable	Not valid, and not reliable

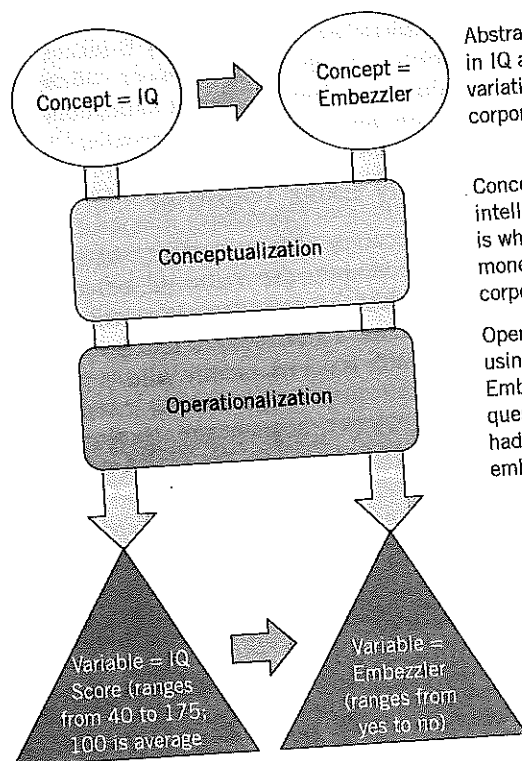
Overview of the Road From Concepts to Variables

This section presents the full process from concept to variables as presented in Figure 4.14. This figure illustrates how you can take a research question about a possible relationship of concepts at the conceptual level and study that relationship using variables. In this example, there are two concepts being studied: IQ and embezzler. In particular, the researcher seeks to understand whether there is an association between variation in IQ and variation in embezzling. Both IQ and embezzling are abstract concepts and not directly measurable. The researcher conceptualized these concepts resulting in two clear conceptual definitions. IQ is conceptualized as the relative intelligence of a person. Embezzler is conceptualized as whether someone had taken money or resources from a corporation illegally.

Based on the conceptual definitions, the researcher operationalized the definitions by describing how he or she would measure the abstract concepts. The researcher used standardized IQ tests to measure the underlying concept of IQ. The researcher opted to use a single measure or question in which a person self-identifies to capture the concept of embezzler, "Have you ever been convicted of embezzling from your corporation?" Are these measures perfect? No measures are perfect. IQ tests have been widely criticized as failing to account for things such as cultural difference, creativity, character, and morality. A person may lie about his or her embezzler status, or a person may have simply forgotten. It may be that for both concepts, multiple measures would be a better approach. For purposes of this example, only one measure for each concept is shown.

Having established these two variables (like the concepts, also labeled "IQ" and "embezzler"), the researcher selected eight people and obtained their IQ scores, and interviewed them to ascertain whether they had ever embezzled. As the table in Figure 4.14 shows, each of the eight people has an IQ and an embezzler score. The scores for both variables vary

Figure 4.14 From Concepts to Variables



Abstract level – RQ: Does variation in IQ among people influence variation in embezzlement among corporate financial officers?

Conceptualization: IQ is the relative intelligence of a person. Embezzler is whether a person had taken money or resources from their corporation illegally.

Operationalization: IQ is measured using a standardized IQ test. Embezzling is measured based on a question asking if the individual had ever been convicted of embezzling from their corporation.

Research question: Is IQ associated with embezzling?

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8
Independent Variable (IQ):	110	110	110	90	80	120	145	101
Dependent Variable (Embezzler):	No	No	Yes	Yes	Yes	No	Yes	No

among the eight respondents. With these data, the researcher would use statistical techniques (covered in Chapter 12) to find evidence, or fail to find evidence, that variation in IQ scores is related to variation in embezzling.



Common Pitfalls in Concepts, Conceptualizations, Operationalizations, Measurements, Variables, and Data in Research Design

The most common pitfall when moving from concepts to variables is a general failure to understand the process, and why it is happening. It has been repeatedly stated (for this reason) that concepts and their relationships are the basis of interest in research. Yet, concepts

of interest are abstract, meaning researchers must identify and use observable measures to *indirectly* study concepts. Those measures are used in research and described as variables. There may be one, two, or many measures used to create a variable.

A second common pitfall is to operationalize using a low level of measurement when higher level of measurement options exist. A frequent pitfall is for someone to use a nominal level of measurement when ratio-level data are easier to gather and offer more information. Santos notes that beginning researchers and students make this error often. When needing to gather data on lighting in an area, they will gather data at the nominal level—lighting is present yes/no. These nominal-level data tell the researcher little about lighting. Later when these developing researchers wish to present more information about lighting, they cannot. They learn that with the same amount of effort, they could have gathered more useful ratio-level data. Similar poor choices can be found when seeking count data. A new researcher may identify only if something is present or not, versus counting it. When counting, a researcher can later offer means and conduct a broader range of analysis. With nominal-level data, the researcher has needlessly restricted his or her research. In general, it is good practice to gather data offering maximum information that presents the least respondent burden.

Labels can be a source of confusion resulting in pitfalls as well. Researchers give concepts and variable names. They may use the same names for concepts and variables, or they may use completely different labels. A researcher must be clear what he or she is speaking of when both the concepts and variables share names. It is useful to draw figures like those shown in this chapter—to have a clear understanding of the proposed relationship between concepts, between variables, as well as the relationships between the concepts and the variables in each research project.

Finally, a common pitfall found especially among new researchers is attempting to use concepts (or variables) that do not vary. An example is posing a question such as “Why don’t old people commit crimes?” First, this is not a well-constructed research question (see Chapter 2). Second, “old people” does not vary. In addition, “not commit crimes” does not vary. Both are constants. A more appropriate approach is to construct a research question such as “How is age related to likelihood of committing crime?” With this new construction, a researcher has two concepts (age and crime commission) that each vary. Be certain to ask, “Does this concept vary?” and “Does this variable vary?” If they do not vary, then all the conceptualization and operationalization in the world cannot create a variable. Research focuses on variation (i.e., variables), not on constants.

Ethics Associated With Concepts, Conceptualizations, Operationalizations, Measurements, Variables, and Data

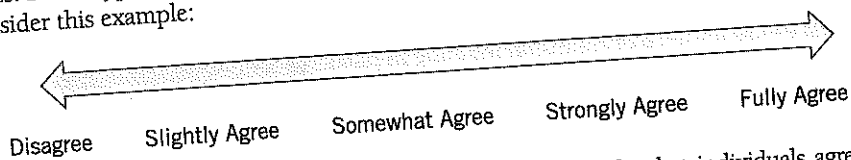
Ethics remain an important consideration at every stage of research. During this stage, a researcher must focus on engaging in this process ethically. It would be unethical to knowingly conceptualize and operationalize in such a way as to create variables and measures that poorly (or fail to) reflect the underlying concepts. A researcher must put in the time and intellectual effort to create measures and variables that are rigorous and accurate. Although no variable or measure is 100% valid, it is ethical to strive to produce as valid of variables and measures as is possible.

Attention must be paid to attributes. A researcher must offer the appropriate attributes for the research under consideration. Offering attributes that will lead to a desired outcome is unethical. Consider research examining intimate partner violence rates by marital category. Given a review of the literature, the researcher should provide multiple response categories or attributes including married, never married, divorced, widowed, and separated. Why is

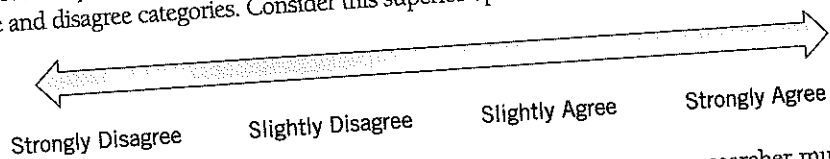


that? Because existing research shows that these categories are each characterized by very different rates of intimate partner violence. It would be unethical and misleading to opt to provide fewer categories that combine higher and lower rate groups such as never married, married (aggregation of currently married, separated and widowed), and divorced. Why is this misleading and unethical if done knowingly? Because married, separated, and widowed groups have wildly different rates (separated rates are very high, widowed rates are very low, and married rates are low but in between the two). By combining these three, the resulting rate is quite low because married individuals dominate the group and mask the very high rates found among separated people. Some with social agendas have done exactly that to encourage marriage, all the while failing to note the dangerously high rates among separated individuals (a period when risk of murder is greatest). Providing attributes to reach a desired outcome is unethical.

Similarly, using attributes to produce a wanted finding can occur with Likert-type scales. Likert-type scales should be balanced, and when they are not, findings are influenced. Consider this example:



In this example, by chance alone, the outcome is going to be that individuals agree with whatever they are being asked about. The better and more ethical approach is to offer balanced agree and disagree categories. Consider this superior option:



In moving from concepts to variables and associated measures, a researcher must strive for the best measurement. Recall a researcher is answering a research question. Setting up research to provide a desired answer is not ethical. Ensure the steps taken do not lead to a desired outcome, but rather, let the research offer evidence of what the truth is.

Concepts, Conceptualizations, Operationalizations, Measurements, Variables, and Data Expert—Brenidy Rice

Brenidy Rice is a problem-solving court coordinator with the state of Colorado's Judicial Department. In this important multidisciplinary role, Brenidy is involved in planning, conducting, evaluating, and implementing research on a daily basis, and she is working with a variety of other public service organizations such as probation, state public defendant's offices, state district attorneys' councils, and the office of behavioral health to do so. She is currently overseeing a large third-party evaluation of the state's problem-solving courts. The overarching goal of this evaluation is to determine the influence of these courts on recidivism, as well as the cost benefits of problem-solving courts. Her day-to-day work with such a variety of entities would not be possible without her understanding of the importance of concepts, conceptualizations, operationalizations, variables, and measurements. Brenidy notes, "I deal with research all the time. In this capacity I must be able to identify and evaluate if the research I am reading or studying is good research." She also notes that

a part of that assessment is based on if the research had conceptualized and operationalized the concepts well. Another way Brenidy works with research is that she must be able to take research findings and convert them into the real world. This is complicated and requires an understanding of the materials discussed in this chapter.

Brenidy's undergraduate degree is in Spanish, and her master's is in public administration and policy. She started her career a dozen years ago working in social work with a nonprofit agency with court-involved families dealing with dependency, abuse, and neglect. In this role, she worked in her clients' homes. Although she recognized her work made a real positive difference in the lives of her clients, she wanted to help others on a larger scale so she changed jobs and was involved with the implementation of several problem-solving courts around the state of Colorado. This ultimately led her to where she is now. While in school, Brenidy did not realize the degree to which she'd use research methods and use them to be successful. There is no doubt her grasp of the skills described in this chapter built a structure for critical thinking and analysis that continues to be a key to her success.

Brenidy recognizes that research is especially important when it comes to problem-solving courts as their success is supported by a robust body of literature that is responsible for bipartisan support of the courts. This body of research, and Brenidy's ability to assess and convey that research to many types of parties, is responsible for gaining and maintaining resources needed to keep these courts going. She notes that individuals working in her field must understand existing research, emerging research, and how new findings may change or enhance what she and others are doing.

Understanding the role of concepts and how they are used in day-to-day research is critical in her success. For example, her office is currently working on a large federal grant focused on dependency and neglect of children. The overall purpose of this grant is to demonstrate the state's success in dealing with dependency and neglect cases. To do so, they first had to wrestle with the concept of success in this context. What is success? How should they define or conceptualize success? How will their office operationalize or measure this success (or lack thereof)? Currently, the office is using ten performance measures including quicker screening times for substance abuse and mental health assessments, whether a child remained in a home, and whether a child who was removed was returned or placed in a permanent home in a shorter period. These and other measures capture the underlying concept of success.

Another concept frequently encountered in Brenidy's work is recidivism. When challenged to reduce recidivism, they must first decide what recidivism means. What is the definition of recidivism? Is it based on a charge by a prosecutor? An arrest? A conviction? How much time goes by before a researcher should measure whether the subject has recidivated? Two years? Five years? Even a seemingly simple concept like recidivism can be challenging to conceptualize, operationalize, and use in research in a professional setting.

As someone who hires people out of college, Brenidy points to three critical skills beyond good research methods that applicants must have. First, she looks for excellent verbal skills. Employees must be able to communicate important information in a concise manner to different audiences. One audience may need details, and another audience may need a brief overview. Common pitfalls she sees in new applicants is the tendency to provide far too much information to the wrong audience (or vice versa). Also, she notes that in a professional setting, the presenter must understand the material being presented. She notes that a researcher cannot bullsh*t professional audiences and that attempts to do so will destroy trust needed to be successful.



Courtesy of Brenidy Rice





A second critical skill a researcher must have is strong written skills. She notes that too many college students with very poor writing skills apply for work and are turned away for that reason only. Brenidy commonly sees grammar and editing errors in applications, and these immediately makes those in the position to hire suspect of the candidate's entire body of work and skills in general. Like verbal skills, written skills must reflect an understanding of the audience the work is intended for. A researcher must know whether the audience will read one page, the first sentence of each paragraph, or require the finer details in a longer piece.

A third critical skill that applicants must have is the ability to engage in group projects. Brenidy notes that everything done in her office is a group project. Every member must pull his or her own weight, know his or her role, respect deadlines, and work with a diverse group of individuals who may use different styles. Those who cannot do this are not useful employees and will likely not be considered for hire.

Brenidy concludes by noting that understanding research, and translating research into programs and policies, is challenging. She recognizes that being able to do so are unique skills but they are extremely valuable. In fact, to be hired in her office, these skills are required. During interviews, candidates are given data and asked what recommendations can be made based on the data. This exercise looks to ascertain whether candidates understand basic research methods including an understanding of conceptualization, operationalization, and other topics described in this chapter.

Chapter Wrap-Up

This chapter presents the stages and skills needed to move from abstract concepts to measurable variables. These steps are crucial, and great attention must be given them to conduct strong and valuable research. Failure to address any of these foundational elements will result in weak research of questionable value. Variables are used to conduct analysis and answer research questions. The stages covered in this chapter include identifying concepts and how they vary. Next, the chapter presented what conceptualization is and why it is performed and important. By using the conceptual definitions resulting from conceptualization, operationalization was described and several examples were provided. These examples included identifying precisely how a researcher can indirectly measure—using one or multiple measures—each concept. Additionally, the chapter covered the variables including types of variables such as independent, dependent, and control variables. Attributes/response categories were also introduced, and the importance of multiple exclusiveness and exhaustiveness in relation to attributes were described. Relatedly, levels of measurement including nominal, ordinal, interval, and ratio were described as well as why these are important. In addition, validity and reliability, including types of each, were introduced and described. Each stage, and each element found in each stage, requires dedicated attention to maximize the value of the research conducted.

How did our case studies deal with the road from concepts to variables? Table 4.4 presents those items for each featured article. As shown, each piece of research dealt with different concepts, variables, and even the way they were handled during research. Finally, the chapter concludes with an interview with Brenidy Rice, a problem-solving court coordinator, who identifies the importance of these steps in her daily work. In the courts, understanding research and thinking deeply about concepts such as success and recidivism, and how to best operationalize them, is critical. In Chapter 5, the different types of samples and a variety of approaches for gathering samples are introduced and described. This chapter takes you one step closer to gathering data for your research.

Applied Assignments

1. Homework Applied Assignment: Conceptualization and Operationalization

Select three concepts used by either Cuevas, Santos, Melde, or Zaykowski in their research. After identifying those concepts, describe how each researcher conceptualized, and then operationalized, those concepts. What variables did they ultimately end up with? What measures were used to measure each concept? What are other ways that the researcher could have done this for each concept? Do you think that each measure used is valid? Why or why not? Be prepared to justify why you stopped when you did in your search. Be prepared to discuss your findings in class.

2. Group Work in Class Applied Assignment: Concepts to Variables in a Survey

As a group, you need five concepts to work with for this assignment. The first two are maturity and happiness. As a group, select three additional criminal justice or criminological concepts that interest you. As a group, describe in detail how you will conceptualize and operationalize each of those five concepts for use in a survey that will be printed and distributed. How will you ultimately measure each concept? What will your survey question look like

exactly? What will the response categories for each survey question include? Be sure to focus on mutual exclusiveness and exhaustiveness if applicable. What are the strengths of your measures? What are the limitations? Be prepared to discuss and share your summaries in class.

3. Internet Applied Assignment: Poor Survey Questions

Select a peer-reviewed academic journal article available online that includes independent and dependent variables. In your thought paper, you need to summarize the research conducted. Identify the dependent variable(s) (DVs) and how it is operationalized/measured. Specify all independent variables (IVs) used in this research and why they are important. Describe the way in which the researcher believes the IVs and DVs are related. Use an illustration to show the purported relationship among the variables. Discuss whether you think other independent variables should be included in their model and why. Identify any missing IVs and why you believe they were not included. What future research questions would these missing variables suggest to you? What were the conclusions of the research? Turn in the journal article with your thought paper.

Table 4.4 Featured Research: Hypotheses, Concepts, and Variables

Researcher	Hypotheses	Major Concepts	Primary Variables Used
Rod Brunson	None	Police relations; Race; Youth; Urbanity - Given the nature of this research, a goal is to identify important concepts	Youths' attitudes toward the police, their personal experiences with officers, their observations of officers, and detailed accounts of their encounters. Identifying concepts that informs future work is a part of this exploratory research



(Continued)