# Practical Research: A Basic Guide to Planning, Doing, and Writing

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# Contents

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## Introduction

The purpose of this book is to provide an introduction to basic practical research. The contents of this book are not inclusive of all things 'research'. However, the topics covered in this book have been selected to best present the 'big picture' regarding entry-level research and was specifically designed for emerging researchers with a background in clinical respiratory care.

## How to approach this book

As you work to shift your perspective from a consumer of research to a contributor of research, it is likely that the scope of your interest in this process will grow beyond the context of this book. This book has been developed in a phasic approach to thinking, designing, and writing about research for the novice researcher:

## *Phase 1: Planning*

Planning your approach to research is perhaps the most important step in the process. In this book, we'll discuss how to to begin shifting your paradigm toward that of a researcher. We'll highlight the planning process which includes the development of a problem and purpose statement and how to craft a research question which will help guide the process of 'doing'.

## *Phase 2: Doing*

Perhaps the most daunting aspect of research for novice researchers is the actual implementation of an intervention and collection of data. As mentioned above, planning is key to successful 'doing'. Chapters 3-5 of this text will discuss how to gather and analyze quantitative and qualitative data, respectively. Again, these chapters are not a replacement for an in-depth understanding of statistical methodology; rather, they have been developed to focus your attention on the general approach to identifying the best answer to your research question.

## *Phase 3: Writing*

The final phase of the research process is to articulate and disseminate the results of your process. Chapter 6 includes a focused approach to creating a research proposal and addressing institutional review board considerations. Chapter 7 outlines how to approach writing a manuscript suitable for dissemination.

As clinician-researchers, it is imperative that we step forward to ensure our profession is not only well represented in the

scientific community, but that all we do continue to be grounded firmly in evidence which supports our practice. Congratulations on becoming part of the scientific community and best of luck with your upcoming research!

PART I

# PHASE I: PLANNING

# 1. Shifting your Mindset: Thinking Like a Researcher

There is a stark difference between being a 'consumer' of research and an 'author' of research. That is, although a reader may look at a research article and glean insight for application to their own practice, the reader relies upon the integrity of both the author, or authors, as well as in the rigor of the journal such that the information presented is accurate enough to be made public and hopefully, adapted. The critical reader will begin to understand that the 'process' of research informs the practice of 'doing'. The novice researcher will begin to apply those processes to investigation of focused inquiry.

So, as you've made it this far, it's likely safe to say that you're interested in evolving past a simple consumer of research and are interested in understanding the process further, maybe even design and implement your own research? First thing is first: You'll need to shift your perspective from, 'I want answers' to 'I have a question'.

*Chapter 1: Learning Objectives*

As you work to shift your perspective from research consumer to research contributor, you'll be able to do the following things:

- Identify the steps of the research process
- Describe the difference between a statement of purpose and a problem statement
- Discuss how to articulate a research question
- Describe the basic considerations for selecting a research approach

## Understanding the Research Process

What goes into pursuing inquiry? This will depend on YOU and the orientation of your interest. That is, there are several factors which will influence your ability to conduct an investigation. Below is a list of broad steps and goals to consider as you begin to 'think like a researcher':

1. **Determine an area of interest**

Chances are that you're drawn to a specific subject area because of something that you're currently doing or because of something that has impacted you personally. It may even be a topic that you're genuinely interested in exploring further. Regardless of the subject matter, it is imperative that you take a systematic approach to your investigation so as not to get lost in the sheer volume of information available to you.

**Goal:** Identify the content source of your question. WHAT is it that you're curious about?

2. **Identify your orientation of interest**

We've established that your interest in a subject is rooted to a connection which drives your interest. Next, you'll need to consider your perspective on the information and discern how your perspective may influence your approach to the research. That is, our biases, either implicit or explicit, have a definite impact on how we approach and utilize the evidence.

> **Goal:** Consider your perspective on the subject and how you are positioned to explore it.

3. **Start digging!**

Although a strong and clear interest is important, you do not want to waste time doing work which has already been done. Your goal as an emerging researcher is to ADD to, or build upon, the evidentiary basis of a topic of interest. The best way to narrow the scope of your interest is to thoroughly review the existing literature on your topic of interest to see what has already been discovered and to identify the spot in which your interests align with a gap in the knowledge about the topic.

> **Goal:** Identify what peer-reviewed literature exists on the subject. Identify the gap in knowledge that you can address.

4. **Gather information**

As you sift through the literature available which pertains to your topic of interest, you will want to have several goals in mind. First, you will want to get a sense for what has already been discovered or is general knowledge about the topic. This foundational reading will serve as the framework for your general understanding about the topic. As you build both a breadth and depth of understanding, you'll likely begin to notice patterns in the literature.

**Goal:** Determine a *problem*. What still needs to be answered in the area you're interested in? What can you do to address this gap?

As you read through the literature, you'll likely start to have more questions than answers. This is normal! However, keep in mind your scope of interest. For example, if you are interested in the rates of depression among post-partum mothers of very premature infants, spending time reading about the rates of depression in traveling salesmen isn't going to be overly helpful and may actually distract you from finding the information you're looking for. If you're having a hard time finding information about what you're looking for… You've already found the problem! That is, perhaps there hasn't been enough work done to establish an understanding about post-partum depression in this particular subgroup of individuals.

The information you gather will help you develop a problem statement, a purpose statement, and articulate a research question.

A **problem statement** is a literature-based concern that is applicable to a wide audience (e.g. a profession). A problem statement is NOT a situation which comes from personal experience. Problem statements should include:

1. The problem itself
2. Who will use the information and why it is important?
3. How your study will address the problem?

*How Should a Problem Statement Be Articulated?*

The problem to be addressed by this study is that there is very little information available regarding the relationship between post-partum depression and the experience of having a very premature infant.

**NOTICE:** this statement addresses the PROBLEM, not the study (that's the purpose statement).

**Goal:** Determine the *purpose* of your research

Developing a purpose statement can be a difficult concept. In a nutshell, the **purpose statement** is your opportunity to tell the audience how your work will address the problem. Typically, the purpose statement follows the problem statement and should include:

- Study design (*HOW*): In very few words, the reader should get a sense of how you are performing this work.
- Intent (*WHY*): The reader should clearly understand why this work is being done.
- Variables or Phenomenon (*WHAT*): The reader should understand what, specifically, is being studied in relation to why. Here is where you have to separate constructs from variables. **Constructs** are ideas or concepts which are not always (but may be) directly measurable. Rather than measuring 'constructs', we search for proxies; or ways to represent a construct. One way we can do this is by identifying variables which measure the construct. A **variable** is a measurable representation of a construct. An important concept here is that a variable must *vary*. That is, there must be at least two levels measured for any one variable. An **Independent Variable** a variable that may explain another variable (AKA: Impact Variables). When you consider the 'independence' of a variable, you must consider how much control can be exerted over the variable. A **Dependent Variable** is a variable that is explained BY other variables (AKA: Outcome Variables). Other Variables: **Mediating variables** are variables that are explained by both independent and

dependent variables. **Moderating variables** are variables which influence the relationship between the independent and dependent variables. **Control variables** are variables which may have an impact on the dependent variable but does not help to explain the dependent variable.

- Participants (WHO): The reader should have a grasp on who this work will pertain to. That is, a **population** describes the entirety of the group you want to draw conclusions about whereas a **sample** is the specific group that you will actually draw conclusions about. Therefore, a sample will always be smaller than the population and the goal is that the findings relating to your sample are generalizable to the population.
- Context (Describe boundaries): Because you will have boundaries which limit your work, you should express them clearly here. These boundaries will influence how you approach, organize, pursue, and present the information. Common boundaries to entry-level research include:

    1. The environment in which the investigation will take place
    2. The access you have to the sample you wish to investigate
    3. The type of data you will collect
    4. The institutional-specific requirements of the research process

*Developing a Quantitative Purpose Statement (Creswell & Creswel, 2018, p. 119 as cited in Gliner et al. 2017)*

The purpose of this _____ (design) study is to _____(test or describe) the theory of _____, which _____(describes, compares, or relates) the _____(independent variable) with _____(Dependent variable), Controlling for _____(name the control variables if appropriate) for_____(Participants) at _____(Site). The independent variables are generally defined as _____(general definition). The dependent variables are generally defined as _____(General definition). The control and intervening variables, _____(identify if appropriate), will be statistically controlled in the study.

*Developing a Qualitative Purpose Statement (Creswell & Creswel, 2018, p. 124 as cited in Gliner et al. 2017)*

The purpose of this _____ (Design) is to _____(understand, describe, explore, develop etc.) the _____(central phenomenon) for _____(participants) at _____(Site). The central

phenomenon is generally defined as _____(General definition).

Now, it may seem as though you've spelled things out for your reader; however, you've still not actually stated the question you have; your **research question**. The type of question will help identify what information should be articulated in the question as well as help describe what approach you will take to answer the question.

A well-defined research question should:

- Frame the focus of the study: Stating explicitly the 'what', 'who', 'why', 'how', and perhaps even 'where' the attention of the work will be focused.
- Set the boundaries of the study to establish scope: Using definitive words will help your reader understand how they will be able to generalize your work to their specific interests.
- Point you toward data needed to answer the question: Although not usually explicitly stated within the question, how you phrase your question should allude to the approach that you are taking and therefore, infer the type of data which will be discussed.

*Quantitative Research Questions*

**Quantitative** approaches are those which make comparisons or examine relationships between or among variables. These types of questions include words like 'cause', 'relate', 'relationship', or 'association'

- Is there a relationship between depression scores on the XYZ scale and mothers who have premature infants born at 28 weeks gestation or fewer?

Quantitative approaches are deductive forms of inquiry where variables are measured using using objective statistical methods to either describe or generalize results.

*Qualitative Research Questions*

**Qualitative** approaches are those where the intention is to explore, discover, or describe an experience or phenomenon. These types of approaches include words like 'how' or 'what'.

- What is the experience of mothers of infants born at 28 weeks gestation or fewer with depression-like symptoms?

Qualitative approaches are inductive forms of inquiry where variables are measured using more subjective

measures that often generate non-numeric data and rely upon educated interpretation for analysis.

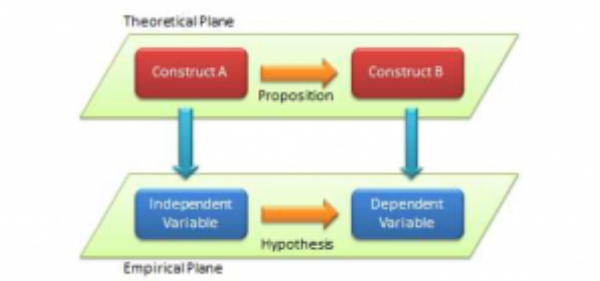
**Goal:** Determine the question you want to ask in order to fill the gap in the understanding of your topic

Overall, your main goal in developing a problem statement, a purpose statement, and a well described question is to first, define the scope of your work and how it fills the gap in understanding you found while digging through the existing research. In working to fill this gap and defining the scope of your work in the context of your gap, clearly delineating your problem, purpose, and question will help guide your approach.

5. **Establish the context**

We've discussed the need to understand the orientation of your inquiry from your perspective. Another important step is to determine whether there is a theoretical or contextual framework which will guide your work. A **theory** is a method of explaining some 'thing'; a behavior, event, or phenomenon. That is, it's a system of interrelated constructs which explain a phenomenon in a bounded system. Theories provide the logic of an observation by explaining what the key drivers and outcomes of a phenomenon are. Theories also help us make sense of an observation by incorporating empirical evidence and comparing outliers to that evidence and provide the foundation for future research by examining the gaps among the relationships and guiding insight about how to address

those gaps. Theory works in parallel with empirical work to reconcile the concept with the evidence




*Parallel Processes of Theoretical and Evidentiary Work*

**Goal:** Identify the theoretical or conceptual framework which will guide your work

6. **Establish the 'HOW'**

Are you planning no observing and describing something objectively? Or, are you planning to be involved with the subjects? Also, something to consider: What is your main goal? That is, are you testing a theory (Positivist)? Or hoping to build a theory (Interpretive)? Are you seeking to test a hypothesis about causal relationships (Experimental)? Or simply describing characteristics or relationships between things (Non-Experimental)? Understanding your end goal will help you to design the best way to answer your research question.

Your approach will become your blueprint for the research process. Identifying 'WHAT' you are studying will help to guide the 'HOW' of your research. Here is a description of several

methods which will help inform 'HOW' you pursue an answer to your research question:

1. Positive methods: TEST theories using a deductive approach. These methods start with a theory in mind and test hypotheses to challenge that theory. Again, many of these approaches are classified as **quantitative**.
    1. Laboratory experiments
    2. Survey research
2. Interpretive methods: BUILD theories using inductive approaches and uses observed data to create a theory. Many of these approaches are classified as **qualitative**.
    1. Action research
    2. Ethnography

As you work to identify both your 'what' and your 'how', it is helpful to understand what types of studies are common throughout your field of inquiry. As you review the literature, take a look at the methods by which the authors have generated their results and take note. Can you utilize similar methods? Or, are you wanting to take a completely different approach? As Jhangiani et al, (n.d.) identify, there are three overarching approaches to research:

- Experimental: Researchers who want to test hypotheses about causal relationships between variables (i.e., their goal is to explain) need to use an experimental method. This is because the experimental method is the only method that allows us to determine causal relationships. Using the experimental approach, researchers

first manipulate one or more variables while attempting to control extraneous variables, and then they measure how the manipulated variables affect participants' responses.

- Quasi Experimental: This design is similar to the experimental design; however, participant assignment is not random.
- Non-Experimental: Researchers who are simply interested in describing characteristics of people, describing relationships between variables, and using those relationships to make predictions can use non-experimental research. Using the non-experimental approach, the researcher simply measures variables as they naturally occur, but they do not manipulate them. For instance, if I just measured the number of traffic fatalities in America last year that involved the use of a cell phone but I did not actually manipulate cell phone use then this would be categorized as non-experimental research. Alternatively, if I stood at a busy intersection and recorded drivers' genders and whether or not they were using a cell phone when they passed through the intersection to see whether men or women are more likely to use a cell phone when driving, then this would be non- experimental research. It is

important to point out that non-experimental does not mean nonscientific. Non-experimental research is scientific in nature. It can be used to fulfill two of the three goals of science (to describe and to predict). However, unlike with experimental research, we cannot make causal conclusions using this method; we cannot say that one variable causes another variable using this method.

Understanding your approach will help identify what kind of data you will be collecting and what you will do what that data. As you consider your approach you will need to consider how sound your research approach is. That is, you'll need to consider how well your study is designed to glean insight that truly represents the behavior, process, or phenomenon that you're investigating. This is where **validity** comes into play. Although the concept of validity is quite extensive, the two primary types of validity you should be concerned with here are internal and external validity.

- **Internal Validity:** Refers to the degree to which we can confidently infer a causal relationship between variables. When we conduct an experimental study in a laboratory environment we have very high internal validity because we manipulate one variable while controlling all other outside extraneous variables. When we manipulate an independent variable and observe an effect on a dependent variable and we control for everything else so that the only difference between our

experimental groups or conditions is the one manipulated variable then we can be quite confident that it is the independent variable that is causing the change in the dependent variable. In contrast, because field studies are conducted in the real-world, the experimenter typically has less control over the environment and potential extraneous variables, and this decreases internal validity, making it less appropriate to arrive at causal conclusions.

- **External Validity**: Refers to the degree to which we can generalize the findings to other circumstances or settings, like the real- world environment. When internal validity is high, external validity tends to be low; and when internal validity is low, external validity tends to be high. So laboratory studies are typically low in external validity, while field studies are typically high in external validity. Since field studies are conducted in the real-world environment it is far more appropriate to generalize the findings to that real-world environment than when the research is conducted in the more artificial sterile laboratory.

**Goal:** Identify the research approach

7. **Gather and analyze your data**

Once your study is complete and the observations have been

made and recorded, researchers need to analyze the data and draw conclusions. Typically, data are analyzed using both descriptive and inferential statistics. **Descriptive statistics** are used to summarize the data and **inferential statistics** are used to generalize the results from the sample to the population. In turn, inferential statistics are used to make conclusions about whether or not a theory has been supported, refuted, or requires modification.

Descriptive Statistics

Descriptive statistics are used to organize or summarize a set of data. Examples include percentages, measures of central tendency (mean, median, mode), measures of dispersion (range, standard deviation, variance), and correlation coefficients.

Measures of central tendency are used to describe the typical, average and center of a distribution of scores. The **mode** is the most frequently occurring score in a distribution. The **median** is the midpoint of a distribution of scores. The **mean** is the average of a distribution of scores.

Measures of dispersion are also considered descriptive statistics. They are used to describe the degree of spread in a set of scores. So are all of the scores similar and clustered around the mean or is there a lot of variability in the scores? The **range** is a measure of dispersion that measures the distance between the highest and lowest scores in a distribution. The **standard deviation** is a more sophisticated measure of dispersion that measures the average distance of scores from the mean. The **variance** is just the standard deviation squared. So it also measures the distance of scores from the mean but in a different unit of measure.

Typically means and standard deviations are computed for experimental research studies in which an independent variable was manipulated to produce two or more groups and a dependent variable was measured quantitatively. The means

from each experimental group or condition are calculated separately and are compared to see if they differ.

For non-experimental research, simple percentages may be computed to describe the percentage of people who engaged in some behavior or held some belief. But more commonly non-experimental research involves computing the correlation between two variables. A **correlation coefficient** describes the strength and direction of the relationship between two variables. The values of a correlation coefficient can range from −1.00 (the strongest possible negative relationship) to +1.00 (the strongest possible positive relationship). A value of 0 means there is no relationship between the two variables. Positive correlation coefficients indicate that as the values of one variable increase, so do the values of the other variable. A good example of a positive correlation is the correlation between height and weight, because as height increases weight also tends to increase. Negative correlation coefficients indicate that as the value of one variable increase, the values of the other variable decrease. An example of a negative correlation is the correlation between stressful life events and happiness; because as stress increases, happiness is likely to decrease.

Inferential Statistics

As you learned in the section of this chapter on sampling, typically researchers sample from a population but ultimately they want to be able to generalize their results from the sample to a broader population. Researchers typically want to infer what the population is like based on the sample they studied. Inferential statistics are used for that purpose. **Inferential statistics** allow researchers to draw conclusions about a population based on data from a sample. Inferential statistics are crucial because the effects (i.e., the differences in the means or the correlation coefficient) that researchers find in a study may be due simply to random chance variability or they may be due to a real effect (i.e., they may reflect a real

relationship between variables or a real effect of an independent variable on a dependent variable).

Researchers use inferential statistics to determine whether their effects are statistically significant. A **statistically significant** effect is one that is unlikely due to random chance and therefore likely represents a real effect in the population. More specifically results that have less than a 5% chance of being due to random error are typically considered statistically significant. When an effect is statistically significant it is appropriate to generalize the results from the sample to the population. In contrast, if inferential statistics reveal that there is more than a 5% chance that an effect could be due to chance error alone then the researcher must conclude that their result is not statistically significant.

It is important to keep in mind that statistics are probabilistic in nature. They allow researchers to determine whether the chances are low that their results are due to random error, but they don't provide any absolute certainty. Hopefully, when we conclude that an effect is statistically significant it is a real effect that we would find if we tested the entire population. And hopefully when we conclude that an effect is not statistically significant there really is no effect and if we tested the entire population we would find no effect. And that 5% threshold is set at 5% to ensure that there is a high probability that we make a correct decision and that our determination of statistical significance is an accurate reflection of reality.

But mistakes can always be made. Specifically, two kinds of mistakes can be made. First, researchers can make a **Type I error**, which is a false positive. This happens when a researcher concludes that their results are statistically significant (there IS an effect in the population) when in reality there is no effect in the population and the results are just due to chance (that is, they are a fluke). When the significance threshold is set to 5%, which is the convention, the boundaries for making a Type I error are 5% chance or less. You might wonder why researchers

don't set it even lower to reduce the chances of making a Type I error. The reason is because when the chances of making a Type I error are reduced, the chances of making a Type II error are increased. A **Type II error** can be considered a 'missed opportunity'. This happens when a researcher concludes that their results are not statistically significant when in reality, there IS an effect in the population and they just missed detecting it. Once again, these Type II errors are more likely to occur when the threshold is set too low (e.g., set at 1% instead of 5%) and/or when the sample was too small.

**Goal**: Procure evidence in pursuit of an answer to your question

[1]

8. **Determine how your findings fit into the knowledge base**

Since statistics are probabilistic in nature and findings can reflect both Type I or Type II errors, we cannot use the results of a single study to conclude with certainty that a theory is true. Rather theories are supported, refuted, or modified based on the results of research.

If the results are statistically significant and consistent with the hypothesis and the theory that was used to generate the hypothesis, then researchers can conclude that the theory is supported. Not only did the theory make an accurate

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prediction, but there is now a new phenomenon that the theory accounts for. If a hypothesis is disconfirmed in a systematic empirical study, then the theory has been weakened. It made an inaccurate prediction, and there is now a new phenomenon that it does not account for.

Although this seems straightforward, there are some complications. First, confirming a hypothesis can strengthen a theory but it can never prove a theory. In fact, scientists tend to avoid the word "prove" when talking and writing about theories. One reason for this avoidance is that the result may reflect a type I error. Another reason for this avoidance is that there may be other plausible theories that imply the same hypothesis, which means that confirming the hypothesis strengthens all those theories equally. A third reason is that it is always possible that another test of the hypothesis or a test of a new hypothesis derived from the theory will be disconfirmed. This difficulty is a version of the famous philosophical "problem of induction." One cannot definitively prove a general principle (e.g., "All swans are white.") just by observing confirming cases (e.g., white swans)—no matter how many. It is always possible that a disconfirming case (e.g., a black swan) will eventually come along. For these reasons, scientists tend to think of theories—even highly successful ones—as subject to revision based on new and unexpected observations.

A second complication has to do with what it means when a hypothesis is disconfirmed. According to the strictest version of the hypothetico-deductive method, disconfirming a hypothesis disproves the theory it was derived from. In formal logic, the premises "if *A* then *B*" and "not *B*" necessarily lead to the conclusion "not *A*." If *A* is the theory and *B* is the hypothesis ("if *A* then *B*"), then disconfirming the hypothesis ("not *B*") must mean that the theory is incorrect ("not *A*"). In practice, however, scientists do not give up on their theories so easily. One reason is that one disconfirmed hypothesis could be a missed opportunity (the result of a type II error) or it could be

the result of a faulty research design. Perhaps the researcher did not successfully manipulate the independent variable or measure the dependent variable.

A disconfirmed hypothesis could also mean that some unstated but relatively minor assumption of the theory was not met. For example, if Zanib had failed to find social facilitation in cockroaches, he could have concluded that drive theory is still correct but it applies only to animals with sufficiently complex nervous systems. That is, the evidence from a study can be used to modify a theory. This practice does not mean that researchers are free to ignore disconfirmations of their theories. If they cannot improve their research designs or modify their theories to account for repeated disconfirmations, then they eventually must abandon their theories and replace them with ones that are more successful.

The bottom line here is that because statistics are probabilistic in nature and because all research studies have flaws there is no such thing as scientific proof, there is only scientific evidence.

**Goal:** Make connections to current research

2

9. **Prepare for dissemination**

The final step in the research process involves reporting the

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results. As described earlier in this chapter, results are typically reported in peer-reviewed journal articles and at conferences.

As Jhangiani et al (n.d.) mention, the most prestigious way to report one's findings is by writing a manuscript and having it published in a peer-reviewed scientific journal. Manuscripts may be published several different types of journals. Formatting standards of the publication will depend on the professional focus. It is likely that you'll need to review the formatting guidelines of the journal carefully prior to submitting your manuscript to ensure that you've addressed each specification.

Typically, a well-developed manuscript will have the following components:

1. Introduction
2. Literature review or thematic constructs
3. Methods
4. Data analysis
5. Results
6. Discussion
7. Limitations
8. Conclusion

Another way to report findings is by writing a book chapter that is published in an edited book. Preferably the editor of the book puts the chapter through peer review but this is not always the case and some scientists are invited by editors to write book chapters.

A fun way to disseminate findings is to give a presentation at a conference. This can either be done as an oral presentation or a poster presentation. Oral presentations involve getting up in front of an audience of fellow scientists and giving a talk that might last anywhere from 10 minutes to 1 hour (depending on the conference) and then fielding questions from the audience. Alternatively, poster presentations involve

summarizing the study on a large poster that provides a brief overview of the purpose, methods, results, and discussion. The presenter stands by their poster for an hour or two and discusses it with people who pass by. Presenting one's work at a conference is a great way to get feedback from one's peers before attempting to undergo the more rigorous peer-review process involved in publishing a journal article.

**Goal:** Fill the knowledge gap

3

*Key Points*

There's a lot to consider when you enter the world of research. However, as with most things, practice makes perfect, or at least a 95% chance of success (see what I did there?). As you move forward in this book, or simply refer back to this chapter, here are some things to remember:

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- Moving from research consumer to research contributor requires a shift in mindset from ‘I want answers’ to ‘I have a question’.
- The process of research is not always linear. Rather, depending on the breadth and depth of your investigation, you may find yourself back at the beginning several times. The process of identifying a research problem, purpose, and question is an iterative process.
- Steps to the research process include:
    - Determining an area of interest
    - Determining your orientation to that interest
    - Digging through the existing base of literature related to your interest
    - Gathering enough information to help you establish
        - A problem statement
        - A purpose statement
        - A research question
    - Establishing the context for your research
    - Establishing the ‘HOW’
    - Gathering and analyzing your data
    - Determining how your findings fit into the base of knowledge
    - Preparing to disseminate your work to add to the base of knowledge

# 2. Considerations in Designing Your Research Approach

Once you've identified your area of interest, sorted through and analyzed the literature to identify the problem you'd like to address, and developed both a purpose and a question; the next step is to design your study. This chapter will provide a basic overview of the considerations any researcher must think about as they design a research study.

*Chapter 2: Learning Objectives*

As you work to identify the best approach to identify an answer to your research question, you will be able to:

- Compare the conceptualization and operational activities of the process
- Discuss the difference between an independent and dependent variable
- Discuss the importance of sampling
- Contrast research approaches
- Demonstrate a systematic approach to selecting a research design

# Understanding the Language of Research

As you work to determine which approach you will consider in order to best answer your question, you'll need to consider how to address both the conceptual and operational components of your inquiry. As we discussed in Chapter 1; theory often informs practice (deductive approaches). Theory is often discussed in terms of abstract, or immeasurable, constructs. Because of the ambiguous nature of theory, it is important to conceptualize the parameters of your investigation. **Conceptualizing** is the process of defining what is or is not included in your description of a specific construct.

*Understanding Theoretical and Contextual Framework*

You may consider the theoretical or contextual framework for your study as the 'lens' through which you want your reader to view the work from. That is, this is your opportunity frame their experience with this information through your educated perspective on the material.

*How Will You Determine the Subjective Aspects of Your Work?*

Consider exploring one's motivation to advance their education:

- Is motivation is the same as effort?
    - That is if you're determining whether clinicians who have advanced credentials are more motivated at work; you'll need to create a clear delineation between motivation and effort and work out how to measure each of these independently

**Operationalization** is the process of defining concepts or constructs in a measurable way. As you dive into the 'HOW' you will go about your research, you will need to understand the terminology related to study design

## Variables

As we discussed in Chapter 1, there are several kinds of Variables. As a reminder, a **variable** is an objective and measurable representation of a theoretical construct. An **independent variable** is a variable which causes an effect on the dependent, or outcome variable. Note that there may be more than one independent variable in your study. Therefore, the **dependent variable** is the variable which you are measuring as an effect of an intervention or influence; you can think of this as the outcome variable. Identifying at least these two variables is an essential first step in designing your study. This is because how you explore the relationship between your effect (independent variable) and outcome (dependent

variable) with help guide your methodology. Other variables to consider include **mediating variables**, which are variables that are explained by both the independent and dependent variables. **Moderating variables** influence the relationship between the independent and dependent variables and **control variables** which may have an impact on the dependent variable but does not help to explain the dependent variable.

*Assigning Dependent and Independent Variables*

You would like to determine the relationship between weight and tidal volume:

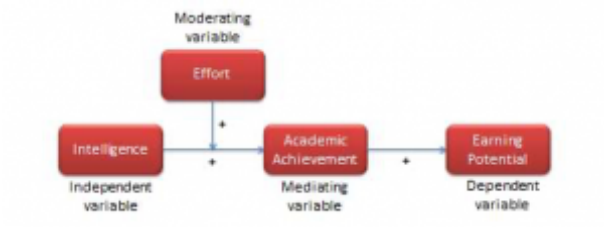
- **Dependent Variable**: Which variable DEPENDS on the other? Or, which variable will define the OUTCOME? (*Tidal volume)*
- **Independent Variable**: Does the variable INFLUENCE, HELP EXPLAIN, or have an IMPACT on the dependent variable? *(Weight)*

*Assigning Dependent and Independent Variables*

You would like to determine whether the number of hours spent in clinical training influences post training test scores:

- **Dependent Variable**: Score on post training test
- **Independent Variable**: Number of hours in clinical training

Identifying and assigning the dependent and independent variable(s) is one of the most important research activities as this will help guide you toward the type of information you'll be collecting and what you will do with that information. However, as you consider both the outcome (dependent) variable and the impact (independent) variable, it is also important to consider what other variables may influence the relationship between these two primary variables.




*Nomological Network of Constructs (Bhattacherjee, 2012)*

There are very few instances wherein you can control EVERY variable. However, it is your job as a researcher to plan for, acknowledge, and attempt to address anything that may influence the results you present.

**levels of measurement** can be thought of as values within each variable. For example, traditionally, the variable 'Gender' had two values: male or female. The modern variable of 'Gender' may have several values which are used to delineate each potential designation within the variable. Each value represents a specific designation of measure.

**Values** of measures may be considered quantitative

(numeric); in our example of traditional gender you may assign a numeric (quantitative) value to male and female as either '1' and '2', respectively. Values may also be assigned non-numerically; meaning they are qualitative. It is important to note that if you want to analyze non-numeric data, it must be coded first.

*Understanding and Assigning Value*

You may create a question asking respondents to rank their agreement with a statement on a scale ranging from strongly disagree to strongly agree. Although qualitative in nature, we can assign a numeric value to each level of measurement as a 'code'.

- 1= Strongly Disagree
- 2= Somewhat Disagree
- 3= Neither Disagree nor Agree
- 4= Somewhat Agree
- 5= Strongly Agree

By doing this, we can explore relationships between the attributes and variables using quantitative statistical methods.

## Levels of measurement

One of the most important aspects of operationalizing a theoretical construct is to determine the level(s) of

measurement. This is done by assessing the types of variables and values:

- **Nominal:** also called categorical. This level of measurement is used to describe a variable with two or more values BUT there is no intrinsic ordering to the categories

*Example of a Nominal Variable*

You would like to collect information about the gender (variable) of individuals participating in your study. Your level of measures may be:

- Male
- Female
- Non-Binary

You may then assign these measures a numeric value:

- Male =1
- Female=2
- Non-Binary=3

- **Ordinal:** This level of measurement is used to describe variable values that have a specific rank order. *BUT* that order does not indicate a specificity between ranks.

*Example of an Ordinal Variable*

You provide a scale of agreement for respondents to indicate their level of agreement with the use of a current policy within the hospital:

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree

Note: Those who strongly disagree with the use of this policy disapprove MORE than do those who disagree; however, there is no quantifiable value for how much more.

- **Interval:** You'll use this level of measurement for variable values which are rank ordered *AND* have specified intervals between ranks and can tell you 'how much more'.

*Example of an Interval Variable*

You classify the ages of the participants in your study:

- 18-24 years old
- 25-30 years old

- 31-35 years old
- >35 years old

NOTE: 35 is 5 more than 30. The quantifiable 'how much more' is what distinguishes age as an interval variable.

- **Ratio:** Ratio values have all of the qualities of a nominal, ordinal, and/or interval scale *BUT ALSO* have a 'true zero'. In this case true zero indicates a lack of the underlying construct (i.e. it does not exist). Additionally, there is a ratio between points on this particular scale. That is, in this case, 10 *IS* twice that of 5.

*Example of a Ratio Variable*

You are doing a pre and post bronchodilator treatment trial for a new drug. You must establish baseline heart rate in your treatment group:

- Pulse rate is a ratio variable because the scale has an absolute zero (asystole) and there is a ratio between the number of times the heart beats (i.e. a change in heart rate of 10 beats per minute)

Identification of variable and values is essential to a successful project. Not only will doing this early in the process allow you to predict factors that may affect your research question, but

it will also guide you toward the type of data you will collect and determine what kind of statistical analyses you will likely be performing in order to understand and present the results of your work.

| Scale | Central Tendency | Statistics | Transformations |
|---|---|---|---|
| Nominal | Mode | Chi-square | One-to-one (equality) |
| Ordinal | Median | Percentile, non-parametric statistics | Monotonic increasing (order) |
| Interval | Arithmetic mean, range, standard deviation | Correlation, regression, analysis of variance | Positive linear (affine) |
| Ratio | Geometric mean, harmonic mean | Coefficient of variation | Positive similarities (multiplicative, logarithmic) |
| Note: All higher-order scales can use any of the statistics for lower order scales. | | | |

*Classification and designation of variable types (Bhattacherjee et al., 2012)*

## Scales

**Scales** are used to glean insight into a situation or phenomenon and can be used to help quantify information that would otherwise be difficult to understand or convey. Although there are several types of scales used by researchers, we'll focus on the two of the most common:

- **Binary scale**: Nominal scale that offers two possible outcomes, or values. Questions that force a respondent to answer either 'yes' or 'no' utilize a binary scale. IF you offer more than two options, your scale is no longer binary, but is still a nominal scaled item

| | | |
|---|---|---|
| Do you have difficulty walking short distances? | Yes | No |
| Do you use your inhaler more than once a day | Yes | No |
| Do you have difficulty sleeping laying completely flat? | Yes | No |
| Do you wake up tired? | Yes | No |

*Binary scale*

- **Likert scales**: Likert scales are popular for measuring

ordinal data and include indications from respondents. Data can be quantified using codes assigned to responses and an overall summation for each attribute can be associated with each respondent

| | Strongly Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Strongly Agree |
|---|---|---|---|---|---|
| I feel confident in my ability to manage my disease | 1 | 2 | 3 | 4 | 5 |
| I feel like my doctor listens to me | 1 | 2 | 3 | 4 | 5 |
| I can tell when I need to increase my oxygen flow | 1 | 2 | 3 | 4 | 5 |
| I can tell when my medicine works | 1 | 2 | 3 | 4 | 5 |

*Likert Scale*

## Sampling

**Sampling** is the statistical process of selecting a subset (called a "sample") of a population of interest for purposes of making observations and statistical inferences about that population. We cannot study entire populations because of feasibility and cost constraints, and hence, we must select a representative sample from the population of interest for observation and analysis. It is extremely important to choose a sample that is truly representative of the population so that the inferences derived from the sample can be generalized back to the population of interest. **Probability sampling** is a technique in which every unit in the population has a chance (non-zero probability) of being selected in the sample, and this chance can be accurately determined. An example of probability sampling is simple random sampling wherein you include ALL possible participants in a population and utilize a method to randomly select a sample that is representative of that population. **Nonprobability Sampling** is a sampling technique in which some units of the population have zero chance of selection or where the probability of selection cannot be accurately determined. Typically, units are selected based on

certain non-random criteria, such as quota or convenience. Because selection is non-random, nonprobability sampling does not allow the estimation of sampling errors, and may be subjected to a sampling bias. Therefore, information from a sample cannot be generalized back to the population. An example of nonprobability sampling is utilizing a convenience sample of participants due to your close proximity or access to them.

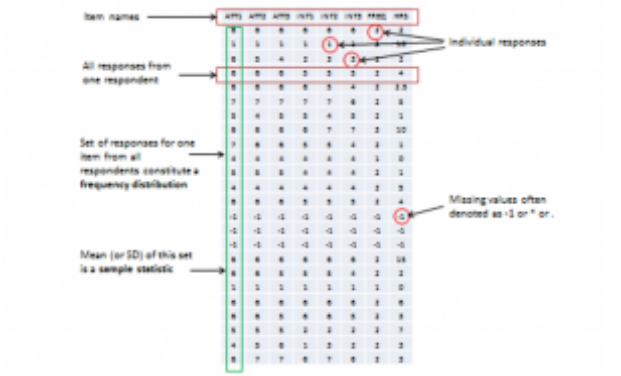
## Why does sampling matter?

When you measure a certain observation from a given unit, such as a person's response to a Likert-scaled item, that observation is called a response. In other words, a response is a measurement value provided by a sampled unit. Each respondent will give you different responses to different items in an instrument. Responses from different respondents to the same item or observation can be graphed into a **frequency distribution** based on their frequency of occurrences. For a large number of responses in a sample, this frequency distribution tends to resemble a bell-shaped curve called a *normal distribution,* which can be used to estimate overall characteristics of the entire sample, such as sample mean (average of all observations in a sample) or standard deviation (variability or spread of observations in a sample). These sample estimates are called *sample statistics* (a "statistic" is a value that is estimated from observed data). Populations also have means and standard deviations that could be obtained if we could sample the entire population. However, since the entire population can never be sampled, population characteristics are always unknown, and are called *population parameters* (and not "statistic" because they are not statistically estimated from data). Sample statistics may differ from population parameters if the sample is not perfectly representative of the

population; the difference between the two is called sampling error. Theoretically, if we could gradually increase the sample size so that the sample approaches closer and closer to the population, then sampling error will decrease and a sample statistic will increasingly approximate the corresponding population parameter.

If a sample is truly representative of the population, then the estimated sample statistics should be identical to corresponding theoretical population parameters. How do we know if the sample statistics are at least reasonably close to the population parameters? Here, we need to understand the concept of a *sampling distribution*. Imagine that you took three different random samples from a given population, as shown below, and for each sample, you derived sample statistics such as sample mean and standard deviation. If each random sample was truly representative of the population, then your three sample means from the three random samples will be identical (and equal to the population parameter), and the variability in sample means will be zero. But this is extremely unlikely, given that each random sample will likely constitute a different subset of the population, and hence, their means may be slightly different from each other. However, you can take these three sample means and plot a frequency histogram of sample means. If the number of such samples increases from three to 10 to 100, the frequency histogram becomes a sampling distribution. Hence, a sampling distribution is a frequency distribution of a sample statistic (like sample mean) from a set of samples, while the commonly referenced frequency distribution is the distribution of a response (observation) from a single sample. Just like a frequency distribution, the sampling distribution will also tend to have more sample statistics clustered around the mean (which presumably is an estimate of a population parameter), with fewer values scattered around the mean. With an infinitely large number of samples, this distribution will

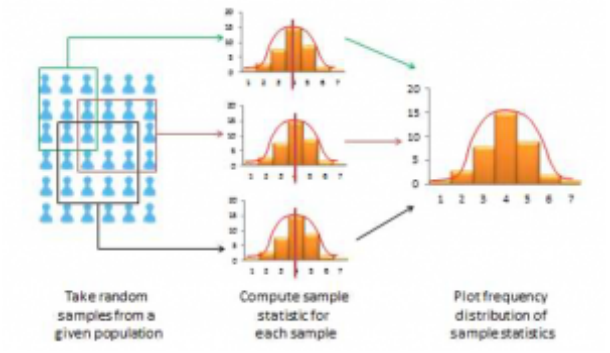
approach a normal distribution. The variability or spread of a sample statistic in a sampling distribution (i.e., the standard deviation of a sampling statistic) is called its standard error. In contrast, the term standard deviation is reserved for variability of an observed response from a single sample.




*Sample Statistic (Bhattacherjee, 2012)*

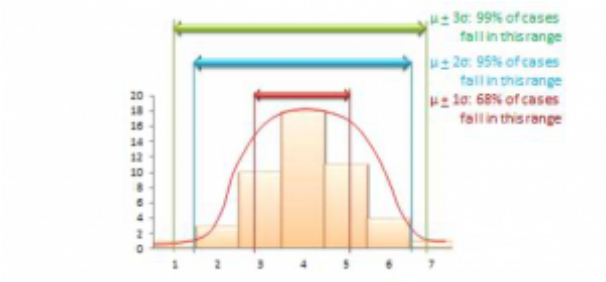
The mean value of a sample statistic in a sampling distribution is presumed to be an estimate of the unknown population parameter. Based on the spread of this sampling distribution (i.e., based on standard error), it is also possible to estimate confidence intervals for that prediction population parameter. Confidence interval is the estimated probability that a population parameter lies within a specific interval of sample statistic values. All normal distributions tend to follow a 68-95-99 percent rule (see below), which says that over 68% of the cases in the distribution lie within one standard deviation of the mean value (μ 1σ), over 95% of the cases in the distribution lie within two standard deviations of the mean (μ 2σ), and over 99% of the cases in the distribution lie within three standard deviations of the mean value (μ 3σ). Since a sampling distribution with an infinite number of samples will approach a normal distribution, the same 68-95-99 rule applies, and it can be said that:

- (Sample statistic one standard error) represents a 68% confidence interval for the population parameter.
- (Sample statistic two standard errors) represents a 95% confidence interval for the population parameter.
- (Sample statistic three standard errors) represents a 99% confidence interval for the population parameter.




*Sampling Distribution (Bhattacherjee, 2012)*

A sample is "biased" (i.e., not representative of the population) if its sampling distribution cannot be estimated or if the sampling distribution violates the 68-95-99 percent rule. As an aside, note that in most regression analysis where we examine the significance of regression coefficients with $p<0.05$, we are attempting to see if the sampling statistic (regression coefficient) predicts the corresponding population parameter (true effect size) with a 95% confidence interval. Interestingly, the "six sigma" standard attempts to identify manufacturing defects outside the 99% confidence interval or six standard deviations (standard deviation is represented using the Greek letter sigma), representing significance testing at $p<0.01$.




*Confidence Intervals (Bhattacherjee, 2012)*

[1]

## Types of Research Designs

There are many different approaches to research. The list provided here is not exhaustive by any means; rather, this is a brief list of the most common approaches you may identify as you review the literature related to your interest.

### Experimental

Experimental research is typically performed in a controlled environment so that the researcher can manipulate an independent variable and measure the outcome (dependent variable) between a group of subjects who received the manipulated variable (intervention) and a group of subjects who did not receive the intervention. This type of design

1. This section can be attributed to Bhattacherjee, A. (2012) published under Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported License

typically adheres to the scientific method in order to test a hypothesis. A **hypothesis** is a proposed explanation for a phenomenon and serves as the starting point for the investigation. You may see a hypothesis indicated as ($H_O$), also called the null hypothesis. This is to differentiate it from an alternative hypothesis ($H_1$ or $H_A$), which is any hypothesis other than the null.

*Development of the Hypothesis*

There are two types of hypotheses, the null (HO) and an alternative ($H_1$ or $H_A$)

- $H_O$= There is no significant difference between length of stay for patients diagnosed with COPD and those diagnosed with CHF.
- $H_1$ or $H_A$= There is a significant difference between length of stay for patients diagnosed with COPD and those diagnosed with CHF

NOTE: Accepting the null hypothesis would mean that your data confirm that there is no difference. Rejecting the null would mean that your data indicated that there is a significant difference in patient outcomes for these groups; therefore, rejecting the null means accepting an alternative hypothesis.

**Randomized Experimental:** Participants are randomly assigned to either a treatment (intervention) or a control group. Typically, the treatment group receives an intervention (independent variable) and the outcome of each group is

considered dependent variables and compared for effect. Independent variables in this case are considered *active* in that this variable can be manipulated.

*Example of Randomized Experimental Approach*

You would like to assess outcomes as they relate to the post delivery resuscitation of very low birthweight infants in the delivery room. You have decided that one group will receive direct intubation and surfactant (intervention group) in the delivery room and the other will receive the standard care of CPAP (control group). Participants will be randomly assigned to groups and as a bonus, the assignment to groups will be blinded. You will then compare the difference between participants in each group regarding need for oxygen at 36 weeks adjusted gestational age.

- **Dependent Variable:** Need for oxygen at 36 weeks adjusted gestational age
- **Independent Variable *(Active)***: Administration of surfactant

**Quasi Experimental:** Similar to the randomized experimental approach aside from the random assignment. In quasi-experimental approaches, participants are NOT randomly assigned; however, one group does receive an intervention while the control group does not and outcomes are still compared. The independent variable is also active.

*Example of Quasi Experimental Approach*

You would like to assess outcomes as they relate to the post delivery resuscitation of very low birthweight infants in the delivery room. You have decided that one group will receive direct intubation and surfactant (intervention group) in the delivery room and the other will receive the standard care of CPAP (control group). Participants will be assigned to groups based on administration of maternal steroids. You will then compare the difference between participants in each group regarding need for oxygen at 36 weeks adjusted gestational age.

- **Dependent Variable:** Need for oxygen at 36 weeks adjusted gestational age
- **Independent Variable *(Active)***: Administration of surfactant

## Non Experimental

Non-experimental approaches include a wide variety of approaches; therefore, it is difficult to list them all in a succinct way here. However, it is safe to say that a study approach is considered non-experimental when there lacks intentional manipulation of the independent variable.

**Comparative approach:** Groups are compared to reveal differences in outcome (dependent variable). Groups are

typically formed based on independent variables that cannot be manipulated but are important to the study. This type of independent variable is known as an *attribute* independent variable. In this approach there are a few categories (2-4 levels) of attribute independent variables that are then compared.

*Example of Comparative Approach*

You would like to investigate the perceptions of first and second year student-instructor engagement and student learning and instructor motivation in the clinical environment.

- **Dependent Variable**: Student perception of experience (2 levels: First and second year)
- **Independent Variable**: Student-instructor engagement in learning and motivation

**Associational or Correlational approach:** Two or more variables for the same group of participants are explored for relationships. Independent variables are also attributive in this approach; meaning, they can be manipulated to impact the dependent variable. Variables included in this approach are typically continuous or have at least five ordered categories.

*Example of Associational or Correlational Approach*

You would like to conduct a study to better understand practitioner attitudes about the future of the profession.

- **Dependent Variable:** Attitude about the future of the profession
- **Independent Variable(s):** Age, gender, autonomy

**Descriptive research:** Projects which only gather data which can be described, not inferred. That is, results and data collected cannot be inferred back to the population nor can comparisons or associations be made. Many qualitative studies are considered descriptive. This is done by considering only one variable at a time and there is no independent variable.

*Example of Descriptive Research*

You would like to describe the development of a protocol to implement high flow nasal cannula as an intermediate therapy for acute respiratory failure to be used in the Emergency Department at your institution. You plan to compare rates of intubation before and after implementation of the protocol.

- You are DESCRIBING a process
- You may collect and compare data using

descriptive statistics

It is important to note that it is possible to have more than one approach in one research project. This is because the approach selected is specific to the question that has been asked. If there is more than one question asked, it is reasonable to assume that more than one approach may be used.

There are a few areas of research that although fit under the category of non-experimental; do not quite fit within the classifications presented here. Two of these areas are quality improvement (QI) projects and protocol development.

**Quality improvement (QI) projects:** The purpose of a QI project is to evaluate the performance of systems, processes, or practices to determine whether either function or operational improvements are needed. Using tools such as the SQUIRE explanation and elaboration guidelines, is extremely helpful in developing, conducting, and analyzing a thorough and impactful QI project.

The SQUIRE guidelines focus on the following four questions:

1. Why did you start?
2. What did you do?
3. What did you find?
4. What does it mean?

These four questions are then expanded upon to help develop the systematic approach to your inquiry and presentation of your findings. An extended investigation of this method is covered in Chapter 6.

**Protocol Development**

Before we dig too deep into the development of protocols, a clarification needs to be made regarding vocabulary relating

to projects of this nature. Although frequently used interchangeably, the terms protocol and guideline are not synonymous. A **protocol** is described as an official procedure or system of rules governing a process. A **guideline** is a suggested course of action, policy, or conduct. In healthcare, this is an important distinction; a protocol is a course of action to which treatment must follow without deviation whereas a guideline, although firmly rooted in evidence, allows for deviation based on best judgment of a clinician or presentation of a specific case. Through a research lens, this distinction is important because the process by which these two objectives are realized are very different. The complete process for the development of guidelines which are generalizable beyond a specific situation is best outlined by the World Health Organization Handbook

The development of both guidelines often involves a team of people who are charged with first evaluating the existing evidence and then contributing an interpretation of that evidence toward the consensus of best practice. This is why guidelines are typically issued by federal or state agencies or professional organization. Protocols are generally less generalizable due to contextual constraints. However, even organizational protocols are not developed by a single individual. This does not mean, however, that you cannot begin the process of developing a guideline or protocol for your organization on you own; rather, it is important to frame the work you contribute as the foundation upon which a group can work toward the consensus of best practice. Typically, this initial work is referred to as a narrative review. A **narrative review** can be described as a broad perspective on a topic which may or may not be impacted by bias. This type of review differs from a systematic review in that it is understood that a narrative review may not encompass all relevant literature on a relevant topic as might a systematic review. Another note; the development of both guidelines and protocols is often an

iterative process requiring several cycles of evaluation and revision. A **systematic review** is described as exhaustive review of the literature relevant to a specific topic. In addition to being exhaustive, a systematic review includes methodology which is both explicit and reproducible to select, evaluate, and synthesize ALL available evidence. A **meta-analysis** is a systematic approach to evaluating the data from independent studies of the same subject to evaluate overall trends. Often, a meta-analysis is part of a systematic review.

## Selecting your approach

As we've discussed, there are several factors which will guide your approach selection. Emphasis should be placed on the development of your purpose and problem statements as well as your research question. Ambiguity in these areas may cause some confusion as you begin to consider what approach you will take to answer your question. Here we will work to narrow the scope of your approach using a systematic process and answering a few specific questions:

**Step 1:** Outlining your general purpose

Understanding the overarching goal of your study will help direct the rest of your approach. Here, you will ask yourself "What am I trying to do?".

| What am I trying to do? | | |
|---|---|---|
| I want to understand more about the relationships between or among variables | **OR** | I want to describe a process, phenomenon, or practice |

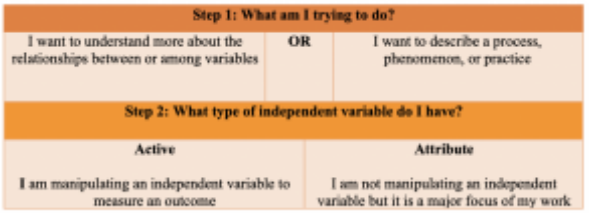
*Step 1: In order to understand which study approach to select, one must first understand what they are really trying to find; that is, what is the overarching purpose of the study?*

**Step 2:** Identifying your general approach

Earlier we discussed the difference between experimental and non-experimental approaches. As we mentioned, these are two broad categories of approaches. Your general purpose will determine which of these two general approaches you take. The determination here will point you toward a more focused, or specific, approach.

- Experimental: **Experimental research** is typically performed in a controlled environment so that the researcher can manipulate an independent variable and measure the outcome (dependent variable) between a group of subjects who received the manipulated variable (intervention) and a group of subjects who did not receive the intervention. A true experimental approach means that you have random selection or assignment of participants. All other elements aside, if you do NOT have randomization incorporated into your approach, your approach becomes quasi-experimental.

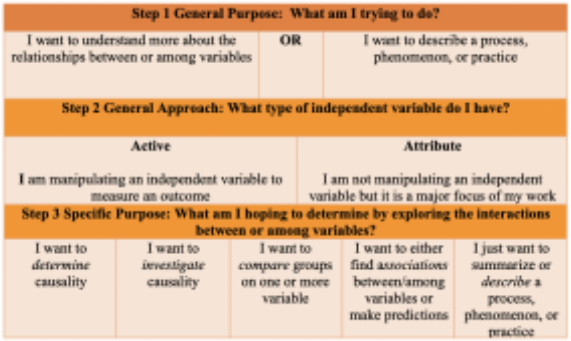
- Non-experimental: **Nonexperimental research** is an extremely broad category of approaches. Therefore, the simplest way to explain non-experimental research is to simply state that this approach lacks the manipulation of an independent variable. That is, you are not imposing an intervention on one group and comparing the outcome with a control group. Rather, you may have attribute independent variables which influence, or impact, the dependent variable, but the purpose of the research is not the direct manipulation of that variable. There are several different types of non-experimental research approaches, as we will soon see; however, it is important to understand that descriptive research is always classified as nonexperimental.




*Step 2: General approaches are usually classified as either experimental or non-experimental*

**Step 3:** Narrowing down your specific purpose

Now that you've decided what the general purpose and approach, you can begin to really narrow down the 'how' of your research. I find that this is best done by again asking yourself what you are really trying to do. Now that you understand the boundaries of your purpose and approach, you can work to understand the fine points about what types of interactions between variables you're looking to explore and determine.

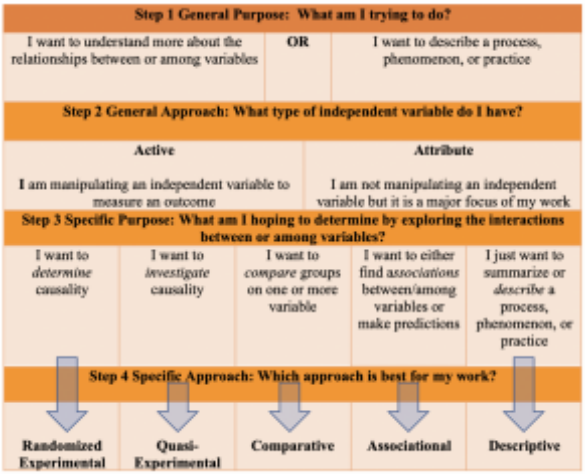



*Step 3: Indicate the what you are hoping to determine by looking at the interactions among variables included in your work.*

**Step 4**: Selecting your specific approach

As you can see, there are specific words you should pay attention to when you're describing your purpose. Given these key words, like 'determine causality', or 'compare groups', you'll have a bit more direction as to what approach is most appropriate to identify the best answer to your question. Once we know what it is we really want to do with the information we're planning to gather (variables), we can select an approach.

Selecting your specific approach




*Step 4: The resultant approach designation as a result answering questions about your work systematically.*

*Key Takeaways*

There are several important concepts presented in this chapter:

- The theoretical/conceptual framework is the frame, or lens, that YOU build for your reader. It is the perspective through which you would like them to view your work.
- Constructs represent abstract theory
- Variables are the concrete measures of constructs
- There are several different types of variables; however, understanding the relationship between the independent variable (impact variable) and the dependent variable (outcome variable) is extremely important
- Attributes are levels within variables
- Attributes and variables must be classified in terms of measurement: Nominal, ordinal, interval, and ratio variables each represent different information and must be assessed correctly to have meaning
- Sampling is very important because whether your sample represents the larger population is an important factor in how your research is presented and interpreted
- There are A LOT of different approaches to research. Systematically approaching the selection of your approach by first defining your

problem and purpose statements and your research question will be helpful as you narrow your focus on the which approach best captures the interaction between or among variables

## Resources

Crawford, L.M., Burkholder, G.J., Cox, K.A. (2020). Writing the Research Proposal. In G.J. Burkholder, K.A Cox, L.M. Crawford, and J.H. Hitchcock (Eds.), *Research design and methods: An applied guide for the scholar-practitioner* (pp. 309-334). Sage Publications

Gliner, J.A., Morgan, G.A., & Leech, N.L. (2017). *Research methods in applied settings: An integrated approach to design and analysis.* Routledge

PART II

# PHASE II: DOING

# 3. Gathering and Analyzing Quantitative Data

Although the goal of any research study is to gather information to analyze, this process can be a little daunting. Hopefully, you've taken the time to plan your approach so that you have a clear plan for the type of information you'll be gathering and the process by which you will assign meaning and glean an understanding about what you've collected. As was the case with designing your approach to your study, a systematic method by which you plan the analysis of your data will make your life a whole lot easier. This chapter will provide a basic overview of how to gather data and begin the analysis of those data with an overview of quantitative statistical approaches.

*Chapter 3: Learning Objectives*

As you work to understand how best to approach gathering and analyzing quantitative data you will:

- Describe the methodology of developing measurement instruments to gather and quantify data
- Discuss the factors that influence the coding

process

- Describe how relationships between dependent and independent variables influence selection of statistical approach
- Compare questions of difference, association, and description
- Identify both basic and complex statistical approaches specific to a research question

# Basic Approaches to Gathering and Analyzing Quantitative Data

## Developing or Selecting Measurement Instruments

There are several methods by which data can be gathered. These methods will be directed by the approach you've taken as well as the question you're investigating. Methods by which data may be gathered include, but are not limited to:

1. Case or patient specific information
2. Questionnaires or surveys
3. Structured interviews
4. Observations
5. Tests
6. Standardized inventories

The method by which you will gather data is hugely important

to the validity of your results. Ideally, a researcher would utilize established measurement tools which have been validated through consistent study. However, this is not always feasible. When you cannot utilize a validated instrument (e.g. a common questionnaire or scale) to measure variables in your specific sample, the instrument you either revise or develop should at least be pilot tested. **Pilot testing** is a procedure by which measurement tools or instruments are implemented on a small scale to evaluate the feasibility and identify adverse events in design prior to implementing the tool in a larger study.

## Collecting Data

Again, the type and amount of data will depend on the approach you've selected. Regardless of this, however, all data will need to be checked to ensure that it is 'clean'. This means removing duplicated responses or entries or other erroneous or inconsistent data that may impact your ability to analyze. Note: You should never change or alter data collected. Rather, if there are inconsistencies in how you expected the data to be collected, you must decide how to deal with those issues *before* moving forward.

*Dealing with Data Collection Issues*

You have asked respondents how well the

training you provided met the objectives outlined at the beginning of the course using a likert scale (1=strongly disagree; 5= strongly agree). You have several respondents who encircled 4 and 5. You now have to decide what to do with this data. You have a few options:

- Create a new category of scores using the average of 4+5 (9/2=4.5)
- You can exclude all respondents who did this

**Note:** When designing questionnaires or surveys, it is essential to ensure that the questions are clear and concise by utilizing directive language such as, "Select the option most appropriate...", or "Which ONE of the following".

Data must then be transferred into a format where it can be sorted and analyzed. The most common approaches to this is to either input or export data to software such as Microsoft Excel(TM) or specialized statistical software such as Statistical Packages for the Social Sciences (SPSS) (TM).

*Data Input*

Data may be entered either manually or electronically imported to analysis software:

K11

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Patient ID# | ICU | Diagnosis | Death | VAP Dx | Vent LOS | Vt/kg post ARDS Dx |
| 2 | 26538 | BDT-MICU | Sepsis | | x | 18 | 6.0 |
| 3 | 24859 | BDT-SICU | Trauma | x | | 4 | 5.0 |
| 4 | 27094 | BDT-MICU | Sepsis | x | | 10 | 6.4 |
| 5 | 23049 | BMCMH-ICU | Pneumonia | | | 6 | 8.4 |
| 6 | 24536 | BDT-MICU | Pneumonia | | | 7 | 5.8 |
| 7 | 26352 | BDT-SICU | Post-op | | | 6 | 6.7 |
| 8 | 20033 | BDT-SICU | Trauma | | x | 14 | 6.3 |
| 9 | 22717 | BDT-MICU | Sepsis | x | | 7 | 6.4 |
| 10 | 29113 | BDT-MICU | Pneumonia | | | 6 | 5.3 |
| 11 | 23846 | BMCMH-ICU | Sepsis | x | x | 16 | 7.8 |
| 12 | 29546 | BMCMH-ICU | Sepsis | x | x | 19 | 8.0 |
| 13 | 24674 | BDT-SICU | Trauma | x | | 11 | 5.8 |

*Example dataset in Microsoft Excel(TM) delineating raw, uncoded data*

## Coding

Coding may be thought of as the process of translating the information you've gathered such that variables can 'talk' to one another through analysis. This is done by numbers to the attributes, or layers, within a variable. There are a few rules governing how this is done:

1. Each coded level within a variable must be mutually exclusive: Only one value can be used to code each layer within a variable

*Mutually Exclusive Coding*

In our dataset example, patients may only be in one location, so you can code the each layer exclusively:

- BDT-MICU (Coded as '1')
- BDT-SICU (Coded as '2')
- BMCMH-ICU (Coded as '3')

Similarly, each diagnosis may be coded independently:

- Sepsis (Coded as '1')
- Trauma (Coded as '2')
- Pneumonia (Coded as '3')
- Post-Op (Coded as '4')

E1 CODEDDX

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | Patient ID# | ICU | CODEDICU | Diagnosis | CODEDDX |
| 2 | 28573 | BDT-MICU | 1 | Sepsis | 1 |
| 3 | 27359 | BDT-SICU | 2 | Trauma | 2 |
| 4 | 26096 | BDT-MICU | 1 | Sepsis | 1 |
| 5 | 26902 | BMCMH-ICU | 3 | Pneumonia | 3 |
| 6 | 24221 | BDT-MICU | 1 | Pneumonia | 3 |
| 7 | 27785 | BDT-SICU | 2 | Post-op | 4 |
| 8 | 27152 | BDT-SICU | 2 | Trauma | 2 |
| 9 | 28668 | BDT-MICU | 1 | Sepsis | 1 |
| 10 | 29758 | BDT-MICU | 1 | Pneumonia | 3 |
| 11 | 26412 | BMCMH-ICU | 3 | Sepsis | 1 |
| 12 | 24135 | BMCMH-ICU | 3 | Sepsis | 1 |
| 13 | 29264 | BDT-SICU | 2 | Trauma | 2 |
| 14 | 21239 | BDT-SICU | 2 | Post-op | 4 |

*Altered dataset to indicate mutually exclusive coding of variables.*

There are instances wherein more than one response is indicated or where there may be a designation within each variable. In these cases, each designation would need to have a separate code (e.g. 'yes'/'no'). In

our example, patients either have ventilator associated pneumonia (VAP), or they did not. Similarly, patients either died, or did not. You will need to code each layer to indicate whether it was experienced:

- VAP (yes= '1', no= '0')
- Death (yes= '1', no= '0')

| | A | B | C | D | E | F | G |
|---|---|---|---|---|---|---|---|
| 1 | Patient ID# | ICU | CODEDICU | Diagnosis | CODEDDX | Death | VAP Dx |
| 2 | 20412 | BDT-MICU | 1 | Sepsis | 1 | 0 | 1 |
| 3 | 22820 | BDT-SICU | 2 | Trauma | 2 | 1 | 0 |
| 4 | 22385 | BDT-MICU | 1 | Sepsis | 1 | 1 | 0 |
| 5 | 24307 | BMCMH-ICU | 3 | Pneumonia | 3 | 0 | 0 |
| 6 | 23867 | BDT-MICU | 1 | Pneumonia | 3 | 0 | 0 |
| 7 | 22904 | BDT-SICU | 2 | Post-op | 4 | 0 | 0 |
| 8 | 21448 | BDT-SICU | 2 | Trauma | 2 | 0 | 1 |
| 9 | 24652 | BDT-MICU | 1 | Sepsis | 1 | 1 | 0 |
| 10 | 28676 | BDT-MICU | 1 | Pneumonia | 3 | 0 | 0 |
| 11 | 21561 | BMCMH-ICU | 3 | Sepsis | 1 | 1 | 1 |
| 12 | 28905 | BMCMH-ICU | 3 | Sepsis | 1 | 1 | 1 |
| 13 | 23538 | BDT-SICU | 2 | Trauma | 2 | 1 | 0 |
| 14 | 22070 | BDT-SICU | 2 | Post-op | 4 | 0 | 1 |

*Designating separate codes for layers within a variable*

2. For each variable entered, there must be a code assigned: Numeric codes need to be applied to all data entries, except for missing responses. In the case of missing data, leave the cell blank. Leaving the cell blank ensures that the item will be counted as 'missing' rather than associated with a different code. Depending on the software being used, designating missing data as 'N/A' may result in errors during analysis.

3. Coding needs to be consistent: As you make decisions about how to proceed with your data, it is imperative that your decisions are consistent across the entire data set. For example, if you decide that you will be excluding a participant with missing data, you must exclude all missing data.

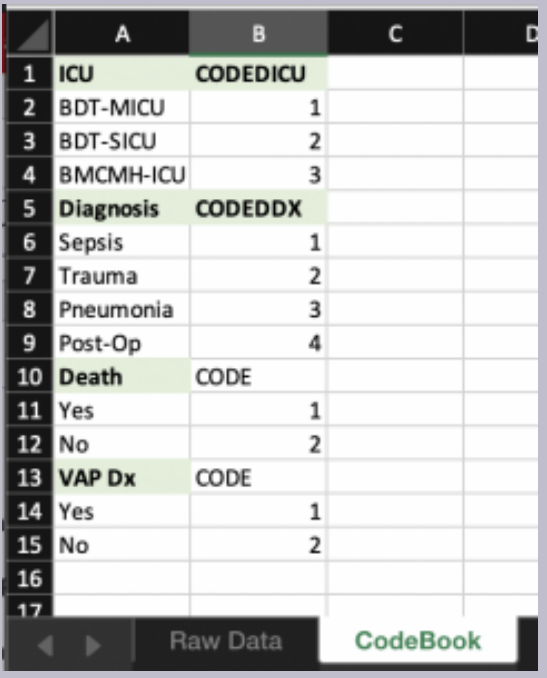
4. Data relating to specific cases or responses must be organized: Each variable relating to a participant must be

organized in a way which relates to that participant. For our example above, patients are indicated in column 'A'. Subsequent columns are variables which relate to that patient; however, each piece of data relating to the specific patient is indicated in the row associated with that specific patient. This is important to ensure that data is correctly attributed during analyses.

5. Variables need to be labeled appropriately: It's common to need to abbreviate the names of variables. Do this in a way which helps you remain organized. If you want to keep the data one one sheet, you can simply add a coded column next to the original variable. Or, you can begin an entirely new spreadsheet of coded variables. Regardless of ;approach, you'll need to keep a record of how you've changed variable names and assigned codes. Creating a codebook will help you recall which codes were assigned to which attributes so that you can correctly interpret analyses.

*Creating a Codebook*

Creating a codebook is imperative to ensuring you can correctly interpret the analyses you perform on the data



| | A | B | C | D |
|---|---|---|---|---|
| 1 | **ICU** | **CODEDICU** | | |
| 2 | BDT-MICU | 1 | | |
| 3 | BDT-SICU | 2 | | |
| 4 | BMCMH-ICU | 3 | | |
| 5 | **Diagnosis** | **CODEDDX** | | |
| 6 | Sepsis | 1 | | |
| 7 | Trauma | 2 | | |
| 8 | Pneumonia | 3 | | |
| 9 | Post-Op | 4 | | |
| 10 | **Death** | CODE | | |
| 11 | Yes | 1 | | |
| 12 | No | 2 | | |
| 13 | **VAP Dx** | CODE | | |
| 14 | Yes | 1 | | |
| 15 | No | 2 | | |
| 16 | | | | |
| 17 | | | | |

Raw Data | CodeBook

*Developing a codebook can help ensure you correctly interpret the analyses performed*

## Selecting the Appropriate Statistical Method

In chapter 2, we discussed three types of general statistical approaches:

- Experimental: Has an active independent variable. The purpose of the study is to manipulate the independent variable to evaluate the impact of that variable on the

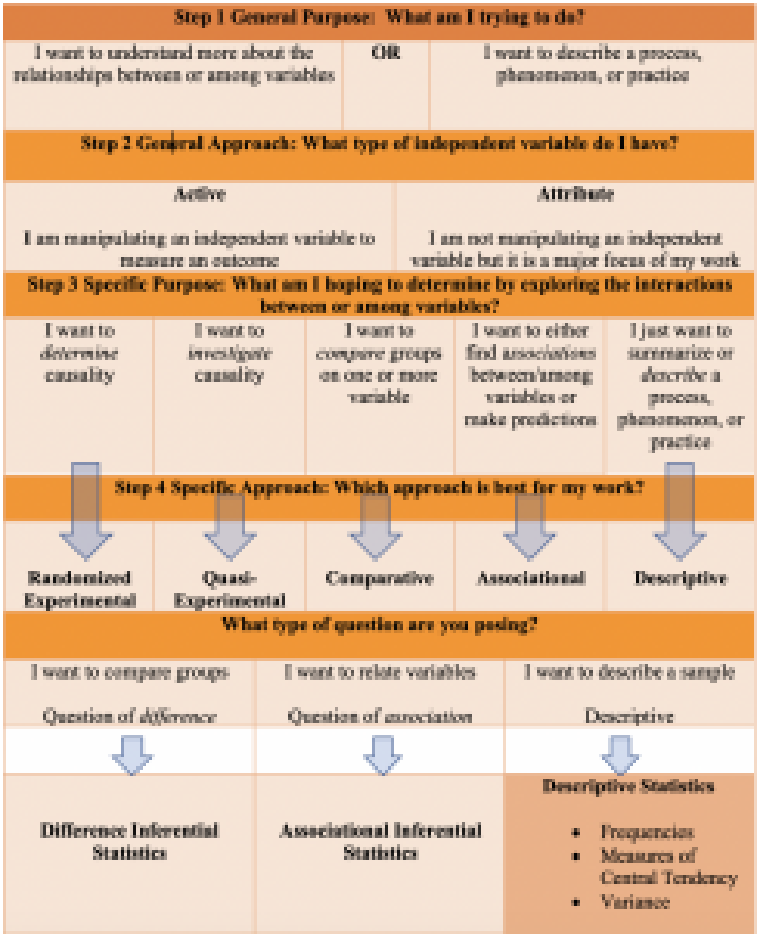
dependent variable; may experimental (randomized sampling) or quasi-experimental (sample not randomized)
- Non-Experimental: Has an attribute independent variable rather than an active independent variable. The purpose of the study is to explore relationships among variables. Survey and observational research fit into this category.
- Descriptive: Does not have an independent variable. The purpose of descriptive research is to describe a selected sample rather than make inferences about that sample to the population.

We also discussed five types of specific approaches:

- Randomized experimental
- Quasi-experimental
- Comparative
- Associational/Correlational
- Descriptive

If you recall, we underscored that the type of question central to your work guides the selection of your research approach. Similarly, the type of question you're asking will help to guide your selection of appropriate statistical approaches to analyze the data you've collected. There are three main types of questions and it's important to note that a research project may incorporate several different statistical approaches, depending on the type of question(s) asked.

Adding to the chart introduced in chapter two, information relating to the purpose of the research question, we can identify the next step in identifying the most appropriate statistical approach.




*Identifying the purpose of your question is the next step in identifying which statistical approach you will utilize.*

## Descriptive questions

Descriptive questions seek to describe a specific sample. Descriptive statistics include measures of central tendency and variability.

*Examples of Descriptive Statistics*

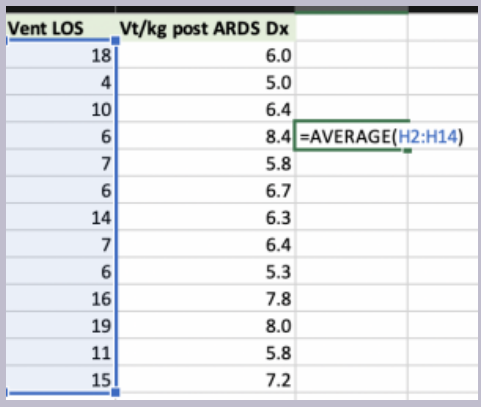
- Frequency distributions
    - This is a description of the number of participants who fit into any one attribute or variable. This number may include the percentage of the sample that this number represents

| Diagnosis | Number (%) |
|---|---|
| Sepsis | 5 (38.4) |
| Trauma | 3 (23) |
| Pneumonia | 3 (23) |
| Post-Op | 2 (15.3) |
| Total | 13 |

*Example of a frequency table for diagnoses included in a small sample*

- Measures of Central Tendency
    - What is the tendency of the data to cluster around certain values (i.e. mean, median, and mode)?

- Mean= Average (sum of the measurements divided by the number of entries) of all numerical data included for a specific variable

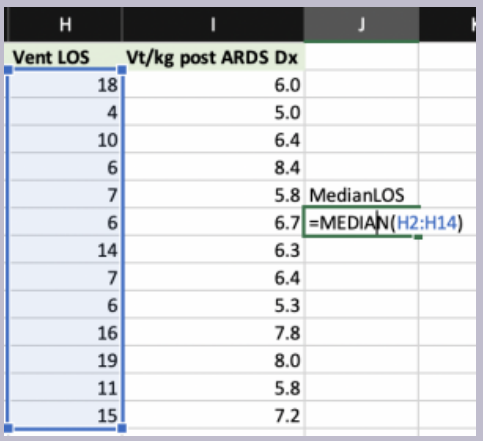


| Vent LOS | Vt/kg post ARDS Dx | | |
|---|---|---|---|
| 18 | 6.0 | | |
| 4 | 5.0 | | |
| 10 | 6.4 | | |
| 6 | 8.4 | =AVERAGE(H2:H14) | |
| 7 | 5.8 | | |
| 6 | 6.7 | | |
| 14 | 6.3 | | |
| 7 | 6.4 | | |
| 6 | 5.3 | | |
| 16 | 7.8 | | |
| 19 | 8.0 | | |
| 11 | 5.8 | | |
| 15 | 7.2 | | |

-

| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | AverageLOS |
| 6 | 8.4 | 10.6923077 |
| 7 | 5.8 | |
| 6 | 6.7 | |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

- Median= The middle number when numeric data are arranged in either ascending or descending order



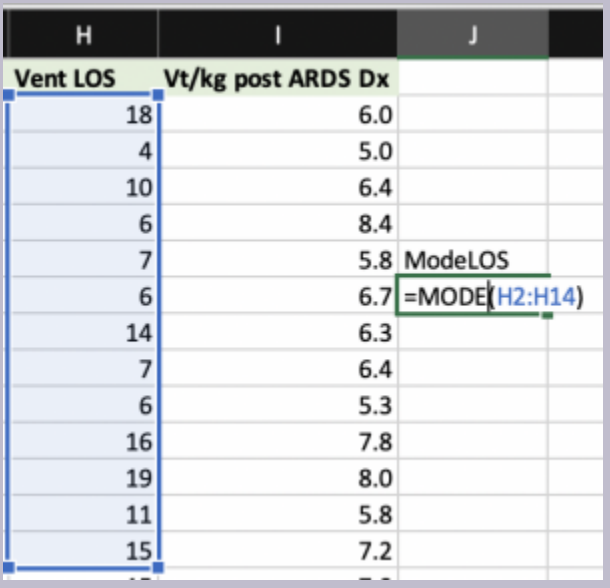
| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | |
| 6 | 8.4 | |
| 7 | 5.8 | MedianLOS |
| 6 | 6.7 | =MEDIAN(H2:H14) |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

*Calculating the Median*

| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | |
| 6 | 8.4 | |
| 7 | 5.8 | MedianLOS |
| 6 | 6.7 | 10 |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

*Designation of the median*

- Mode: The measurement that occurs most frequently in a set of data



| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | |
| 6 | 8.4 | |
| 7 | 5.8 | ModeLOS |
| 6 | 6.7 | =MODE(H2:H14) |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

*Designation of the Mode*

| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | |
| 6 | 8.4 | |
| 7 | 5.8 | ModeLOS |
| 6 | 6.7 | 6 |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

*Designation of the Mode*

- Variability: Describes the spread of scores within a data set
    - Standard deviation is the most common when the data is normally distributed

| H | I | J |
|---|---|---|
| Vent LOS | Vt/kg post ARDS Dx | |
| 18 | 6.0 | |
| 4 | 5.0 | |
| 10 | 6.4 | |
| 6 | 8.4 | |
| 7 | 5.8 | SD |
| 6 | 6.7 | 2.86747275 |
| 14 | 6.3 | |
| 7 | 6.4 | |
| 6 | 5.3 | |
| 16 | 7.8 | |
| 19 | 8.0 | |
| 11 | 5.8 | |
| 15 | 7.2 | |

*Identifying the standard deviation*

## Questions of difference

Answers to these questions center on the comparison of groups and the difference between those groups. Randomized experimental, quasi-experimental, and comparative approaches support questions of difference and therefore, use similar statistical approaches. Questions of difference utilize difference inferential statistics because the goal is to compare groups' average scores on a dependent variable.

The selection of either basic or complex difference statistics

will depend on how many independent and/or independent variables you are comparing:

## *One dependent and/or independent variable*

As we've discussed, understanding the relationships between or among your dependent and independent variable(s) is extremely important. If you identify only one dependent and/or independent variable, Gliner, Morgan and Leech (2017) indicate that there are a few considerations you'll need to investigate:

1. Is your dependent variable normally distributed AND all assumptions met?
    1. Yes?
2. Do you have one independent variable with two categories?
    1. Yes ? Consider the following:
        1. **Independent t-test:** Used to compare means of independent samples or groups with one independent variable with two categories.
        2. **Paired t-test:** Used to compare means of repeated measures within the same group with one independent variable with two categories.
3. Do you have one independent variable with two or more categories?
    1. Yes ? Consider the following:
        1. **One way ANOVA**: Used to compare means of independent samples or groups with one independent variable that has two or more categories.
        2. **Repeated Measures ANOVA**: Used to compare means of repeated measures or related samples with one independent variable that has two or

more categories.

4. Is your dependent variable ordinal or not normally distributed?
    1. Yes?
        1. Are you comparing medians or ranks?
            1. Yes
        2. Do you have one independent variable with two categories?
            1. Yes? Consider the following:
                1. **Mann-Whitney** can be used to compare medians or ranks of groups with one independent variable that has two categories.
                2. **Wilcoxon** or **Sign test** can be used to compare medians or ranks within groups which have one independent variable with two categories
        3. Do you have one independent variable with two or more categories?
            1. Yes? Consider the following
                1. **Kruskal-Wallis** can be used to compare medians or ranks of independent samples with one independent variable but that has two or more categories.
                2. **Friedman test** can be used to compare medians or ranks for repeated measures or related samples with one independent variable that has two or more categories.
5. Is your dependent variable nominal (categorical)?
    1. Yes?
        1. Are you comparing counts?
            1. Yes?

2. Do you have one independent variable with two categories?
    1. Yes? Consider the following:
        1. **Chi Square** or **Fisher's exact test** can be used to compare counts within groups which have one independent variable with two categories. Chi square is a nonparametric test (used when sample is NOT normally distributed)
        2. **Mcnemar** can be used to compare counts within groups which have one independent variable with two categories.
3. Do you have one independent variable with two or more categories?
    1. **Chi Square** can also be used to compare counts of independent samples with one independent variable but with that has two or more categories.
    2. **Cochran Q Test** can be used to compare counts for repeated measures or related samples with one independent variable that has two or more categories.

## *More than one independent and/or dependent variable*

The inclusion of more than one independent and/or dependent variable will require the use of fairly complex statistical tests such as:

- **Factorial ANOVA** with or without repeated measures
    - Factorial ANOVA can be used to measure two or more independent variables between groups when you

have one dependent variable; assuming normal distribution.
    - Factorial ANOVA with repeated measures can be used to explore means of groups that are related, have one dependent variable, and two or more independent variables
- **Log Linear**
    - Log linear should only be used with a dependent variable is nominal and you are looking at differences between groups with more than two independent variables.
- **MANOVA** with or without repeated measures
    - MANOVA can be used in when looking at differences between groups with several dependent variables and two or more independent variables.
    - MANOVA with repeated measures can be used in when looking at differences within a group and has several dependent variables as well as two or more independent variables.

## Questions of association

Answers to these questions seek to identify whether there is an association or correlation between at least two variables. Associational inferential statistics can also be used to help predict associations between variables.

The selection of either basic or complex difference statistics will depend on how many independent variables are included in your work (Gliner, Morgan, & Leech, 2017):

### *Only one independent variable*

1. Both variables nominal?
    1. Yes? Consider the following:
        1. **Pearson r or Bivariate regression** to investigate the relationship between two variables for the same subject
2. Both variables ordinal?
    1. Yes? Consider the following:
        1. **Spearman (Rho) or Kendall's Tau** can be used to explore the relationship between the ranks of two variables for the same subject
3. One or both variables nominal?
    1. Yes? Consider the following:
        1. **Phi or Cramer's V** can be used to identify relationships between the counts of two variables for the same subject.

### *Several independent variables*

One continuous dependent variable?

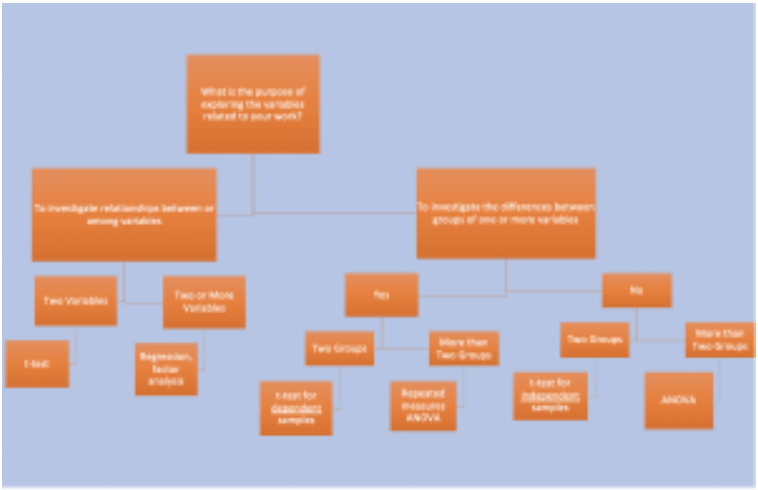
- **Multiple Regression:** Used to predict the value of a variable based on the value of two or more other variables

One dichotomous dependent variable?

- **Discriminant analysis:** Use with normally distributed independent variables
- **Logistic regression:** Use when some independent variables are normal and some dichotomous or when ALL independent variables are dichotomous

## Making it as easy as possible:

Although there are several factors that influence the selection of a statistical test, there are general questions you can ask to help guide your decision. We've covered several of those steps throughout this chapter; however, the figure below, adapted from Salkind and Frey (2020), can be thought of as a quick reference:




*General overview of the most general statistical approaches based on specific questions about your project (Adapted from Salkind & Frey (2020)*

## Additional how-to:

Now that you understand the basic concepts of choosing a statistical approach, you will be able to move forward. Although there are several conditions specific to your work which will impact your choices, understanding the general approach and

considerations is the focus of this text. Additional information about which statistical tests are most appropriate for your specific design, as well as information about how to perform and interpret specific statistics can be found here: Choosing the correct statistical test

*Key Takeaways*

- Data must be collected systematically and prepared for analysis
- Coding is an important step in preparing your data for analysis and must be:
    - Mutually exclusive
    - Numeric and applied to each entry
    - Consistent
    - Organized
- The statistical approach you select will be guided by the study approach you selected and the question you're asking
- Questions can either be of difference, association, or descriptive
- There are both basic and complex statistical approaches for both questions of difference and association
- You must understand the relationship between your dependent and independent variable(s) to identify the most appropriate statistical test
- The selection of statistical approaches is not

'one-size-fits all' and requires specific attention to be paid to the variables specific to the work

## References

Bhattacherjee, A. (2012). Social science research: Principles, methods, and practices. https://open.umn.edu/opentextbooks/textbooks/social-science-research-principles-methods-and-practices

Gliner, J.A., Morgan, G.A., & Leech, N.L. (2017). *Research methods in applied settings: An integrated approach to design and analysis*. Routledge

Salkind, N.J. & Frey, B.B. (2020). *Statistics for people who think they hate statistics*. Sage Publications

# 4. Gathering and Analyzing Qualitative Data

## Gathering and Analyzing Qualitative Data

As the role of clinician researchers expands beyond the bedside, it is important to consider the possibilities of inquiry beyond the quantitative approach. In contrast to the quantitative approach, qualitative methodology is highly inductive and relies on the background and interpretation of the researcher to derive meaning from the gathering and analytic processes central to qualitative inquiry.

*Chapter 4: Learning Objectives*

As you explore the research opportunities central to your interests to consider whether qualitative component would enrich your work, you'll be able to:

- Define what qualitative research is
- Compare qualitative and quantitative approaches
- Describe the process of creating themes from

recurring ideas gleaned from narrative interviews

## What Is Qualitative Research?

Quantitative researchers typically start with a focused research question or hypothesis, collect a small amount of numerical data from a large number of individuals, describe the resulting data using statistical techniques, and draw general conclusions about some large population. Although this method is by far the most common approach to conducting empirical research in fields such as respiratory care and other clinical fields, there is an important alternative called qualitative research. Qualitative research originated in the disciplines of anthropology and sociology but is now used to study psychological topics as well. Qualitative researchers generally begin with a less focused research question, collect large amounts of relatively "unfiltered" data from a relatively small number of individuals, and describe their data using nonstatistical techniques, such as grounded theory, thematic analysis, critical discourse analysis, or interpretative phenomenological analysis. They are usually less concerned with drawing general conclusions about human behavior than with understanding in detail the experience of their research participants.

Consider, for example, a study by researcher Per Lindqvist and his colleagues, who wanted to learn how the families of teenage suicide victims cope with their loss (Lindqvist, Johansson, & Karlsson, 2008). They did not have a specific research question or hypothesis, such as, What percentage of family members join suicide support groups? Instead, they

wanted to understand the variety of reactions that families had, with a focus on what it is like from their perspectives. To address this question, they interviewed the families of 10 teenage suicide victims in their homes in rural Sweden. The interviews were relatively unstructured, beginning with a general request for the families to talk about the victim and ending with an invitation to talk about anything else that they wanted to tell the interviewer. One of the most important themes that emerged from these interviews was that even as life returned to "normal," the families continued to struggle with the question of why their loved one committed suicide. This struggle appeared to be especially difficult for families in which the suicide was most unexpected.

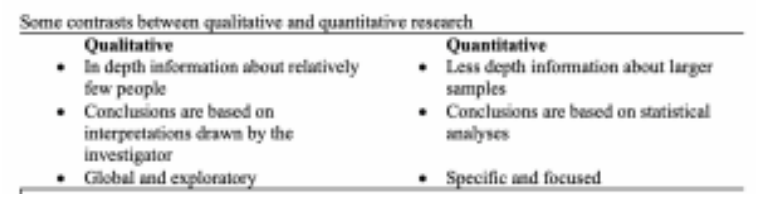
## The Purpose of Qualitative Research

The strength of quantitative research is its ability to provide precise answers to specific research questions and to draw general conclusions about human behavior. This method is how we know that people have a strong tendency to obey authority figures, for example, and that female undergraduate students are not substantially more talkative than male undergraduate students. But while quantitative research is good at providing precise answers to specific research questions, it is not nearly as good at generating novel and interesting research questions. Likewise, while quantitative research is good at drawing general conclusions about human behavior, it is not nearly as good at providing detailed descriptions of the behavior of particular groups in particular situations. And quantitative research is not very good at communicating what it is actually like to be a member of a particular group in a particular situation.

But the relative weaknesses of quantitative research are the relative strengths of qualitative research. Qualitative research

can help researchers to generate new and interesting research questions and hypotheses. The research of Lindqvist and colleagues, for example, suggests that there may be a general relationship between how unexpected a suicide is and how consumed the family is with trying to understand why the teen committed suicide. This relationship can now be explored using quantitative research. But it is unclear whether this question would have arisen at all without the researchers sitting down with the families and listening to what they themselves wanted to say about their experience. Qualitative research can also provide rich and detailed descriptions of human behavior in the real-world contexts in which it occurs. Among qualitative researchers, this depth is often referred to as "thick description" (Geertz, 1973) .

Similarly, qualitative research can convey a sense of what it is actually like to be a member of a particular group or in a particular situation—what qualitative researchers often refer to as the "lived experience" of the research participants. Lindqvist and colleagues, for example, describe how all the families spontaneously offered to show the interviewer the victim's bedroom or the place where the suicide occurred—revealing the importance of these physical locations to the families. It seems unlikely that a quantitative study would have discovered this detail. The table below lists some contrasts between qualitative and quantitative research



Some contrasts between qualitative and quantitative research

| Qualitative | Quantitative |
| --- | --- |
| • In depth information about relatively few people | • Less depth information about larger samples |
| • Conclusions are based on interpretations drawn by the investigator | • Conclusions are based on statistical analyses |
| • Global and exploratory | • Specific and focused |

*Contrasts between qualitative and quantitative research*

## Data Collection and Analysis in Qualitative Research

Data collection approaches in qualitative research are quite varied and can involve naturalistic observation, participant observation, archival data, artwork, and many other things. But one of the most common approaches, especially for psychological research, is to conduct interviews. Interviews in qualitative research can be unstructured—consisting of a small number of general questions or prompts that allow participants to talk about what is of interest to them—or structured, where there is a strict script that the interviewer does not deviate from. Most interviews are in between the two and are called semi-structured interviews, where the researcher has a few consistent questions and can follow up by asking more detailed questions about the topics that come up. Such interviews can be lengthy and detailed, but they are usually conducted with a relatively small sample. The unstructured interview was the approach used by Lindqvist and colleagues in their research on the families of suicide victims because the researchers were aware that how much was disclosed about such a sensitive topic should be led by the families, not by the researchers.

Another approach used in qualitative research involves small groups of people who participate together in interviews focused on a particular topic or issue, known as focus groups. The interaction among participants in a focus group can sometimes bring out more information than can be learned in a one- on-one interview. The use of focus groups has become a standard technique in business and industry among those who want to understand consumer tastes and preferences. The content of all focus group interviews is usually recorded and transcribed to facilitate later analyses. However, we know from social psychology that group dynamics are often at play in any

group, including focus groups, and it is useful to be aware of those possibilities. For example, the desire to be liked by others can lead participants to provide inaccurate answers that they believe will be perceived favorably by the other participants. The same may be said for personality characteristics. For example, highly extraverted participants can sometimes dominate discussions within focus groups.

## Data Analysis in Qualitative Research

Although quantitative and qualitative research generally differ along several important dimensions (e.g., the specificity of the research question, the type of data collected), it is the method of data analysis that distinguishes them more clearly than anything else. To illustrate this idea, imagine a team of researchers that conducts a series of unstructured interviews with people recovering from alcohol use disorder to learn about the role of their religious faith in their recovery. Although this project sounds like qualitative research, imagine further that once they collect the data, they code the data in terms of how often each participant mentions God (or a "higher power"), and they then use descriptive and inferential statistics to find out whether those who mention God more often are more successful in abstaining from alcohol. Now it sounds like quantitative research. In other words, the quantitative-qualitative distinction depends more on what researchers do with the data they have collected than with why or how they collected the data.

But what does qualitative data analysis look like? Just as there are many ways to collect data in qualitative research, there are many ways to analyze data. Here we focus on one general approach called grounded theory (Glaser & Strauss, 1967) . This approach was developed within the field of sociology in the 1960s and has gradually gained popularity in

psychology. Remember that in quantitative research, it is typical for the researcher to start with a theory, derive a hypothesis from that theory, and then collect data to test that specific hypothesis. In qualitative research using grounded theory, researchers start with the data and develop a theory or an interpretation that is "grounded in" those data. They do this analysis in stages. First, they identify ideas that are repeated throughout the data. Then they organize these ideas into a smaller number of broader themes. Finally, they write a theoretical narrative—an interpretation of the data in terms of the themes that they have identified. This theoretical narrative focuses on the subjective experience of the participants and is usually supported by many direct quotations from the participants themselves.

As an example, consider a study by researchers Laura Abrams and Laura Curran, who used the grounded theory approach to study the experience of postpartum depression symptoms among low-income mothers (Abrams & Curran, 2009) . Their data were the result of unstructured interviews with 19 participants. The table below hows the five broad themes the researchers identified and the more specific repeating ideas that made up each of those themes. In their research report, they provide numerous quotations from their participants, such as this one from "Destiny:"

*"Well, just recently my apartment was broken into and the fact that his Medicaid for some reason was cancelled so a lot of things was happening within the last two weeks all at one time. So that in itself I don't want to say almost drove me mad but it put me in a funk....Like I really was depressed. (p. 357)"*

Their theoretical narrative focused on the participants' experience of their symptoms, not as an abstract "affective disorder" but as closely tied to the daily struggle of raising children alone under often difficult circumstances. The table below illustrates the process of creating themes from

repeating ideas in the qualitative research gathering and analysis process.

Themes and repeating ideas in a study of postpartum depression among low-income mothers. Based on research by Abrams and Curran (2009)

| Theme | Repeating ideas |
|---|---|
| Ambivalence | "I wasn't prepared for this baby," "I didn't want to have any more children." |
| Caregiving overload | "Please stop crying," "I need a break," "I can't do this anymore." |
| Juggling | "no time to breathe," "Everyone depends on me," "navigating the maze." |
| Mothering alone | "I really don't have any help," "My baby has no father." |
| Real-life worry | "I don't have any money," "will my baby be OK?" "It's not safe here." |

*Creating themes by grouping repeating ideas*

## The Quantitative-Qualitative "Debate"

Given their differences, it may come as no surprise that quantitative and qualitative research do not coexist in complete harmony. Some quantitative researchers criticize qualitative methods on the grounds that they lack objectivity, are difficult to evaluate in terms of reliability and validity, and do not allow generalization to people or situations other than those actually studied. At the same time, some qualitative researchers criticize quantitative methods on the grounds that they overlook the richness of human behavior and experience and instead answer simple questions about easily quantifiable variables.

In general, however, qualitative researchers are well aware of the issues of objectivity, reliability, validity, and generalizability. In fact, they have developed a number of frameworks for addressing these issues (which are beyond the scope of our discussion). And in general, quantitative researchers are well aware of the issue of oversimplification. They do not believe that all human behavior and experience can be adequately

described in terms of a small number of variables and the statistical relationships among them. Instead, they use simplification as a strategy for uncovering general principles of human behavior.

Many researchers from both the quantitative and qualitative camps now agree that the two approaches can and should be combined into what has come to be called mixed-methods research (Todd, Nerlich, McKeown, & Clarke, 2004). In fact, the studies by Lindqvist and colleagues and by Abrams and Curran both combined quantitative and qualitative approaches. One approach to combining quantitative and qualitative research is to use qualitative research for hypothesis generation and quantitative research for hypothesis testing. Again, while a qualitative study might suggest that families who experience an unexpected suicide have more difficulty resolving the question of why, a well-designed quantitative study could test a hypothesis by measuring these specific variables in a large sample. A second approach to combining quantitative and qualitative research is referred to as triangulation. The idea is to use both quantitative and qualitative methods simultaneously to study the same general questions and to compare the results. If the results of the quantitative and qualitative methods converge on the same general conclusion, they reinforce and enrich each other. If the results diverge, then they suggest an interesting new question: Why do the results diverge and how can they be reconciled?

Using qualitative research can often help clarify quantitative results via triangulation. Trenor, Yu, Waight, Zerda, and Sha (2008) investigated the experience of female engineering students at a university. In the first phase, female engineering students were asked to complete a survey, where they rated a number of their perceptions, including their sense of belonging. Their results were compared across the student

ethnicities, and statistically, the various ethnic groups showed no differences in their ratings of their sense of belonging.

One might look at that result and conclude that ethnicity does not have anything to do with one's sense of belonging. However, in the second phase, the authors also conducted interviews with the students, and in those interviews, many minority students reported how the diversity of cultures at the university enhanced their sense of belonging. Without the qualitative component, we might have drawn the wrong conclusion about the quantitative results.

This example shows how qualitative and quantitative research work together to help us understand human behavior. Some researchers have characterized qualitative research as best for identifying behaviors or the phenomenon whereas quantitative research is best for understanding meaning or identifying the mechanism. However, Bryman (2012) argues for breaking down the divide between these arbitrarily different ways of investigating the same questions.

*Key Takeaways*

- The qualitative approach is centered on an inductive method of reasoning
- The qualitative approach focuses on understanding phenomenon through the perspective of those experiencing it
- Researchers search for recurring topics and group themes to build upon theory to explain findings
- A mixed methods approach uses both

quantitative and qualitative methods to explain different aspects of a phenomenon, processes, or practice

1

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# 5. Approaching Survey Research

## What Is Survey Research?

**Survey research** is a quantitative and qualitative method with two important characteristics. First, the variables of interest are measured using self-reports (using questionnaires or interviews). In essence, survey researchers ask their participants (who are often called respondents in survey research) to report directly on their own thoughts, feelings, and behaviors. Second, considerable attention is paid to the issue of sampling. In particular, survey researchers have a strong preference for large random samples because they provide the most accurate estimates of what is true in the population. Beyond these two characteristics, almost anything goes in survey research. Surveys can be long or short. They can be conducted in person, by telephone, through the mail, or over the Internet. They can be about voting intentions, consumer preferences, social attitudes, health, or anything else that it is possible to ask people about and receive meaningful answers. Although survey data are often analyzed using statistics, there are many questions that lend themselves to more qualitative analysis.

Most survey research is non-experimental. It is used to describe single variables (e.g., the percentage of voters who prefer one presidential candidate or another, the prevalence of schizophrenia in the general population, etc.) and also to assess statistical relationships between variables (e.g., the relationship between income and health). But surveys can also be used within experimental research; as long as there is manipulation

of an independent variable (e.g. anger vs. fear) to assess an effect on a dependent variable (e.g. risk judgments).[1]

*Chapter 5: Learning Objectives*

If your research question(s) center on the experience or perception of a particular phenomenon, process, or practice, utilizing a survey method may help glean useful data. After reading this chapter, you will

- Identify the purpose of survey research
- Describe the cognitive processes involved in responding to questions
- Discuss the importance of context in drafting survey items
- Contrast the utility of open and closed ended questions
- Describe the BRUSO method of drafting survey questions
- Describe the format for survey questionnaires

The heart of any survey research project is the survey itself. Although it is easy to think of interesting questions to ask people, constructing a good survey is not easy at all. The

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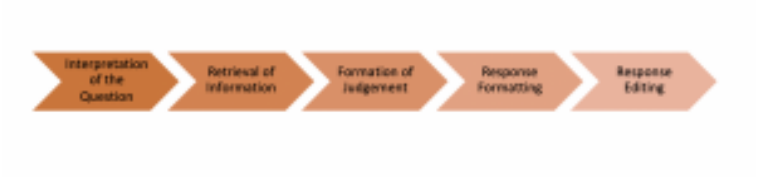
problem is that the answers people give can be influenced in unintended ways by the wording of the items, the order of the items, the response options provided, and many other factors. At best, these influences add noise to the data. At worst, they result in systematic biases and misleading results. In this section, therefore, we consider some principles for constructing surveys to minimize these unintended effects and thereby maximize the reliability and validity of respondents' answers.

## Cognitive Processes of Responses

To best understand how to write a 'good' survey question, it is important to frame the act of responding to a survey question as a cognitive process. That is, there are are involuntary mechanisms that take place when someone is asked a question. Sudman, Bradburn, & Schwarz (1996, as cited in Jhangiani et. al, 2012) illustrate this cognitive process here.




*Progression of a survey response as a cognitive function (Sudman, Bradburn, & Schwarz, 1996, as cited in Jhangiani et al. 2012)*

Framing the formulation of survey questions in this way is extremely helpful to ensure that the questions posed on your survey glean accurate information.

*Example of a Poorly Worded Survey Question*

How many alcoholic drinks do you consume in a typical day?

- A lot more of average
- Somewhat more than average
- Average number
- Somewhat fewer than average
- A lot fewer than average

Although this item at first seems straightforward, it poses several difficulties for respondents. First, they must interpret the question. For example, they must decide whether "alcoholic drinks" include beer and wine (as opposed to just hard liquor) and whether a "typical day" is a typical weekday, typical weekend day, or both. Even though Chang and Krosnick (2003, as cited in Jhangiani et al. 2012) found that asking about "typical" behavior has been shown to be more valid than asking about "past" behavior, their study compared "typical week" to "past week" and may be different when considering typical weekdays or weekend days). Once respondents have interpreted the question, they must retrieve relevant information from memory to answer it. But what information should they retrieve, and how should they go about retrieving it? They might think vaguely about some recent occasions on which they drank alcohol, they might carefully try to recall and count the number of alcoholic drinks they consumed last week, or they might retrieve some existing beliefs that they have about themselves (e.g., "I am not much of a drinker").

Then they must use this information to arrive at a tentative judgment about how many alcoholic drinks they consume in a typical day. For example, this mental calculation might mean dividing the number of alcoholic drinks they consumed last week by seven to come up with an average number per day. Then they must format this tentative answer in terms of the response options actually provided. In this case, the options pose additional problems of interpretation. For example, what does "average" mean, and what would count as "somewhat more" than average? Finally, they must decide whether they want to report the response they have come up with or whether they want to edit it in some way. For example, if they believe that they drink a lot more than average, they might not want to report that for fear of looking bad in the eyes of the researcher, so instead, they may opt to select the "somewhat more than average" response option.

From this perspective, what at first appears to be a simple matter of asking people how much they drink (and receiving a straightforward answer from them) turns out to be much more complex.

## Context Effects on Survey Responses

Again, this complexity can lead to unintended influences on respondents' answers. These are often referred to as context effects because they are not related to the content of the item but to the context in which the item appears (Schwarz & Strack, 1990, as cited in Jhangiani et al. 2012). For example, there is an item-order effect when the order in which the items are presented affects people's responses. One item can change how participants interpret a later item or change the information that they retrieve to respond to later items. For example, researcher Fritz Strack and his colleagues asked college students about both their general life satisfaction and

their dating frequency (Strack, Martin, & Schwarz, 1988, as cited in Jhangiani et al. 2012) . When the life satisfaction item came first, the correlation between the two was only −.12, suggesting that the two variables are only weakly related. But when the dating frequency item came first, the correlation between the two was +.66, suggesting that those who date more have a strong tendency to be more satisfied with their lives. Reporting the dating frequency first made that information more accessible in memory so that they were more likely to base their life satisfaction rating on it.

The response options provided can also have unintended effects on people's responses (Schwarz, 1999, as cited in Jhangiani et al. 2012) . For example, when people are asked how often they are "really irritated" and given response options ranging from "less than once a year" to "more than once a month," they tend to think of major irritations and report being irritated infrequently. But when they are given response options ranging from "less than once a day" to "several times a month," they tend to think of minor irritations and report being irritated frequently. People also tend to assume that middle response options represent what is normal or typical. So if they think of themselves as normal or typical, they tend to choose middle response options. For example, people are likely to report watching more television when the response options are centered on a middle option of 4 hours than when centered on a middle option of 2 hours. To mitigate against order effects, rotate questions and response items when there is no natural order. Counterbalancing or randomizing the order of presentation of the questions in online surveys are good practices for survey questions and can reduce response order effects that show that among undecided voters, the first candidate listed in a ballot receives a 2.5% boost simply by virtue of being listed first!

## Writing Survey Items

### Types of Items

Questionnaire items can be either open-ended or closed-ended. **Open-ended** items simply ask a question and allow participants to answer in whatever way they choose. The following are examples of open-ended questionnaire items.

- "What is the most important thing to teach children to prepare them for life?"
- "Please describe a time when you were discriminated against because of your age."
- "Is there anything else you would like to tell us about?"

Open-ended items are useful when researchers do not know how participants might respond or when they want to avoid influencing their responses. Open-ended items are more qualitative in nature, so they tend to be used when researchers have more vaguely defined research questions—often in the early stages of a research project. Open-ended items are relatively easy to write because there are no response options to worry about. However, they take more time and effort on the part of participants, and they are more difficult for the researcher to analyze because the answers must be transcribed, coded, and submitted to some form of qualitative analysis, such as content analysis. Another disadvantage is that respondents are more likely to skip open-ended items because they take longer to answer. It is best to use open-ended questions when the answer is unsure or for quantities which can easily be converted to categories later in the analysis.

**Closed-ended** items ask a question and provide a set of response options for participants to choose from.

*Examples of Closed-Ended Questions*

How old are you?

- Under 18
- 19-34
- 35-49
- 50-70

On a scale of 0 (no pain at all) to 10 (the worst pain ever experienced), how much pain are you in right now?

Closed-ended items are used when researchers have a good idea of the different responses that participants might make. They are more quantitative in nature, so they are also used when researchers are interested in a well-defined variable or construct such as participants' level of agreement with some statement, perceptions of risk, or frequency of a particular behavior. Closed-ended items are more difficult to write because they must include an appropriate set of response options. However, they are relatively quick and easy for participants to complete. They are also much easier for researchers to analyze because the responses can be easily converted to numbers and entered into a spreadsheet. For these reasons, closed- ended items are much more common.

All closed-ended items include a set of response options from which a participant must choose. For categorical variables like sex, race, or political party preference, the categories are usually listed and participants choose the one (or ones) to which they belong. For quantitative variables, a

rating scale is typically provided. A rating scale is an ordered set of responses that participants must choose from.

| | Strongly Disagree | Somewhat Disagree | Neutral | Somewhat Agree | Strongly Agree |
|---|---|---|---|---|---|
| I feel confident in my ability to manage my disease | 1 | 2 | 3 | 4 | 5 |
| I feel like my doctor listens to me | 1 | 2 | 3 | 4 | 5 |
| I can tell when I need to increase my oxygen flow | 1 | 2 | 3 | 4 | 5 |
| I can tell when my medicine works | 1 | 2 | 3 | 4 | 5 |

*Likert Scale*

The number of response options on a typical rating scale ranges from three to 11—although five and seven are probably most common. Five-point scales are best for unipolar scales where only one construct is tested, such as frequency (Never, Rarely, Sometimes, Often, Always). Seven- point scales are best for bipolar scales where there is a dichotomous spectrum, such as liking (Like very much, Like somewhat, Like slightly, Neither like nor dislike, Dislike slightly, Dislike somewhat, Dislike very much). For bipolar questions, it is useful to offer an earlier question that branches them into an area of the scale; if asking about liking ice cream, first ask “Do you generally like or dislike ice cream?” Once the respondent chooses like or dislike, refine it by offering them relevant choices from the seven-point scale. Branching improves both reliability and validity (Krosnick & Berent, 1993, as cited in Jhangiani et al. 2012) . Although you often see scales with numerical labels, it is best to only present verbal labels to the respondents but convert them to numerical values in the analyses. Avoid partial labels or length or overly specific labels. In some cases, the verbal labels can be supplemented with (or even replaced by) meaningful graphics.

## Writing Effective Items

We can now consider some principles of writing questionnaire items that minimize unintended context effects and maximize the reliability and validity of participants' responses. A rough guideline for writing 9 questionnaire items is provided by the BRUSO model (Peterson, 2000, as cited in Jhangiani et al. 2012 ) . An acronym, **BRUSO** stands for "brief," "relevant," "unambiguous," "specific," and "objective." Effective questionnaire items are brief and to the point. They avoid long, overly technical, or unnecessary words. This brevity makes them easier for respondents to understand and faster for them to complete. Effective questionnaire items are also relevant to the research question. If a respondent's sexual orientation, marital status, or income is not relevant, then items on them should probably not be included. Again, this makes the questionnaire faster to complete, but it also avoids annoying respondents with what they will rightly perceive as irrelevant or even "nosy" questions. Effective questionnaire items are also unambiguous; they can be interpreted in only one way. Part of the problem with the alcohol item presented earlier in this section is that different respondents might have different ideas about what constitutes "an alcoholic drink" or "a typical day." Effective questionnaire items are also specific so that it is clear to respondents what their response should be about and clear to researchers what it is about. A common problem here is closed- ended items that are "double barreled." They ask about two conceptually separate issues but allow only one response.

*Example of a "Double Barreled" question*

Please rate the extent to which you have been feeling anxious and depressed

- Very
- Somewhat
- Not at all

**Note:** The issue in the question itself is that anxiety and depression are two separate items and should likely be separated

Finally, effective questionnaire items are objective in the sense that they do not reveal the researcher's own opinions or lead participants to answer in a particular way. The best way to know how people interpret the wording of the question is to conduct a pilot test and ask a few people to explain how they interpreted the question.

| Criterion | Poor | Effective |
|---|---|---|
| B–Brief | "Are you now or have you ever been the possessor of a firearm?" | "Have you ever owned a gun?" |
| R–Relevant | "What is your sexual orientation?" | Do not include this item unless it is clearly relevant to the research. |
| U–Unambiguous | "Are you a gun person?" | "Do you currently own a gun?" |
| S–Specific | "How much have you read about the new gun control measure and sales tax?" | "How much have you read about the new sales tax?" |
| O–Objective | "How much do you support the new gun control measure?" | "What is your view of the new gun control measure?" |

*The BRUSO method of writing question items.*

For closed-ended items, it is also important to create an appropriate response scale. For categorical variables, the categories presented should generally be mutually exclusive and exhaustive. Mutually exclusive categories do not overlap.

For a religion item, for example, the categories of Christian and Catholic are not mutually exclusive but Protestant and Catholic are mutually exclusive. Exhaustive categories cover all possible responses. Although Protestant and Catholic are mutually exclusive, they are not exhaustive because there are many other religious categories that a respondent might select: Jewish, Hindu, Buddhist, and so on. In many cases, it is not feasible to include every possible category, in which case an 'Other' category, with a space for the respondent to fill in a more specific response, is a good solution. If respondents could belong to more than one category (e.g., race), they should be instructed to choose all categories that apply.

For rating scales, five or seven response options generally allow about as much precision as respondents are capable of. However, numerical scales with more options can sometimes be appropriate. For dimensions such as attractiveness, pain, and likelihood, a 0-to-10 scale will be familiar to many respondents and easy for them to use. Regardless of the number of response options, the most extreme ones should generally be "balanced" around a neutral or modal midpoint.

*Example of an unbalanced versus balanced rating scale*

**Unbalanced rating scale measuring perceived likelihood**

Unlikely | Somewhat Likely | Likely | Very Likely | Extremely Likely

**Balanced rating scale measuring perceived likelihood**

Extremely Unlikely | Somewhat Unlikely | As Likely as Not | Somewhat Likely |Extremely Likely

Note, however, that a middle or neutral response option does not have to be included. Researchers sometimes choose to leave it out because they want to encourage respondents to think more deeply about their response and not simply choose the middle option by default. However, including middle alternatives on bipolar dimensions can be used to allow people to choose an option that is neither.

## Formatting the Survey

Writing effective items is only one part of constructing a survey. For one thing, every survey should have a written or spoken introduction that serves two basic functions (Peterson, 2000, as cited by Jhangiani et al. 2012). One is to encourage respondents to participate in the survey. In many types of research, such encouragement is not necessary either because participants do not know they are in a study (as in naturalistic observation) or because they are part of a subject pool and have already shown their willingness to participate by signing up and showing up for the study. Survey research usually catches respondents by surprise when they answer their phone, go to their mailbox, or check their e-mail—and the researcher must make a good case for why they should agree to participate. This means that the researcher has only a moment to capture the attention of the respondent and must make it as easy as possible for the respondent to participate. Thus the introduction should briefly explain the purpose of the survey and its importance, provide information about the sponsor of

the survey (university-based surveys tend to generate higher response rates), acknowledge the importance of the respondent's participation, and describe any incentives for participating.

The second function of the introduction is to establish informed consent. Remember that this involves describing to respondents everything that might affect their decision to participate. This includes the topics covered by the survey, the amount of time it is likely to take, the respondent's option to withdraw at any time, confidentiality issues, and so on. Written consent forms are not always used in survey research (when the research is of minimal risk and completion of the survey instrument is often accepted by the IRB as evidence of consent to participate), so it is important that this part of the introduction be well documented and presented clearly and in its entirety to every respondent.

The introduction should be followed by the substantive questionnaire items. But first, it is important to present clear instructions for completing the questionnaire, including examples of how to use any unusual response scales. Remember that the introduction is the point at which respondents are usually most interested and least fatigued, so it is good practice to start with the most important items for purposes of the research and proceed to less important items. Items should also be grouped by topic or by type. For example, items using the same rating scale (e.g., a 5-point agreement scale) should be grouped together if possible to make things faster and easier for respondents. Demographic items are often presented last because they are least interesting to participants but also easy to answer in the event respondents have become tired or bored. Of course, any survey should end with an expression of appreciation to the respondent.

2

## Coding your survey responses

Once you've closed your survey, you'll need to identify how to quantify the data you've collected. Much of this can be done in ways similar to methods described in the previous two chapters. Although there are several ways by which to do this, here are some general tips:

1. **Transfer data**: Transfer your data to a program which will allow you to organize and 'clean' the data. If you've used an online tool to gather data, you should be able to download the survey results into a format appropriate for working the data. If you've collected responses by hand, you'll need to input the data manually.
2. **Save:**ALWAYS save a copy of your original data. Save changes you make to the data under a different name or version in case you need to refer back to the original data.
3. **De-identify:** This step will depend on the overall approach that you've taken to answer your research question and may not be appropriate for your project.
4. **Name the variables:** Again, there is no 'right' way to do this; however, as you move forward, you will want to be sure you can easily identify what data you are extracting. Many times, when you transfer your data the program will automatically associate data collected with the question

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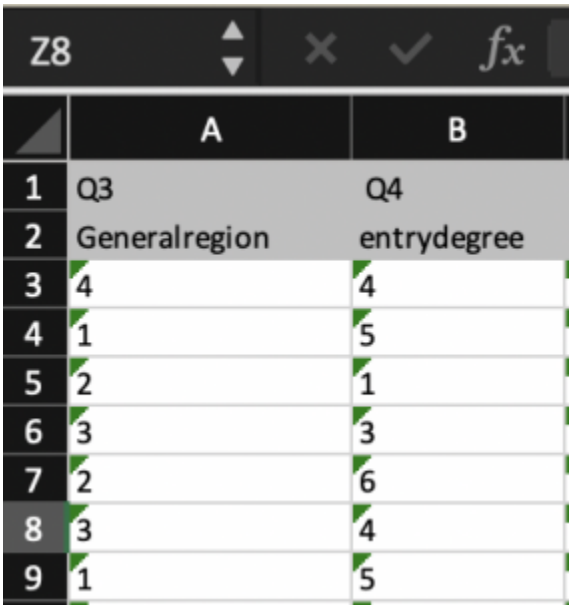
asked. It is a good idea to name the variable something associated with the data, rather than the question

5. **Code the attributes**: Each variable will likely have several different attributes, or layers. You'll need to come up with a coding method to distinguish the different responses. As discussed in previous chapters, each attribute should have a numeric code associated so that you can quantify the data and use descriptive and/or inferential statistical methods to either describe or explore relationships within the dataset.



Z8

| | A | B |
|---|---|---|
| 1 | Q3 | Q4 |
| 2 | Generalregion | entrydegree |
| 3 | 4 | 4 |
| 4 | 1 | 5 |
| 5 | 2 | 1 |
| 6 | 3 | 3 |
| 7 | 2 | 6 |
| 8 | 3 | 4 |
| 9 | 1 | 5 |

*The name of the variable should indicate the information to be gleaned*

This is relatively simple to accomplish with closed-ended questions. Because you've 'forced' the respondent to pick a concrete answer, you can create a code that is

associated with each answer. In the picture above, respondents were asked to identify their region and given a list of geographical regions and in structed to pick one. The researcher then created a code for the regions. In this case, 1= West; 2= Midwest; 3= Northeast; 4= Southeast; and 5= Southwest. If you're working to quantify data that is somewhat qualitative in nature (i.e. open ended questions) the process is a little more complicated. You'll need to either create themes or categories, classify types or similar responses, and then assign codes to those themes or categories.

6. **Create a codebook**: This.is.essential. Once you begin to code the data, you will have somewhat disconnected yourself from the data by translating the data from a language that we understand to a language which a computer understands. Af ter you run your statistical methods, you'll translate it back to the native language and share findings. To stay organized and accurate, it is important that you keep a record of how the data has been translated.

7. **Analyze:** Once you have the data inputted, cleaned, and coded, you should be ready to analyze your data using either descriptive or inferential methods, depend. ing on your approach and overarching goal.

*Key Takeaways*

- Surveys are a great method to identify

information about perceptions and experiences

- Question items must be carefully crafted to elicit an appropriate response
- Surveys are often a mixed-methods approach to research
- Both descriptive and inferential statistical approaches can be applied to the data gleaned through survey responses
- Surveys utilize both open and closed ended questions; identifying which types of questions will yield specific data will be helpful as you plan your approach to analysis
- Most surveys will need to include a method of informed consent, and an introduction. The introduction should clearly delineate the purpose of the survey and how the results will be utilized
- Pilot tests of your survey can save you a lot of time and heartache. Pilot testing helps to catch issues in the development of item, accessibility, and type of information derived prior to initiating the survey on a larger scale
- Survey data can be analyzed much like other types of data; following a systematic approach to coding will help ensure you get the answers you're looking for

PART III

# PHASE III: WRITING

# 6. Preparing Your Research Proposal

More often than not, there will be a few steps that you'll have to take before you can start gathering and analyzing data in pursuit of an answer to your research question. Preparing a research proposal is a milestone in any research project and is often required by sponsoring institutions in order to transition from 'the 'planning' phase to the 'doing' phase. So why, you might ask, are we talking about this step in phase III, 'writing'? That's a great question and it has to do, primarily, with the order of thought and the information that must be included in a research proposal. In this chapter, we'll cover the basic requirements of most research proposals and address the requirements and responsibilities of a researcher.

*Chapter 6: Learning Objectives*

Before you prepare to implement your research methodology, it is likely that you'll need to gain approval to continue. As we explore the development of the research proposal, you'll be able to:

- Describe the individual elements of a research proposal
- Delineate between the rationale and implementation portions of a research proposal

- Discuss the ethical tenets which govern researchers
- Define the purpose of an institutional review board
- Compare categories of institutional review board applications

## What is a research proposal?

A research proposal can be thought of as the general blueprint for a proposed research project. There are very few instances wherein research projects can be pursued without support of a sponsoring institution. That is, a healthcare system, hospital, or academic institution. To receive support from a sponsoring institution, a researcher must articulate a clear plan for their research process to include:

1. An overview of the literature which supports the investigation
2. A statement of the problem
3. A statement of purpose
4. A hypothesis or central question
5. An overview of how participants will be identified, selected, contacted or data will be identified, analyzed, and protected
6. An overview of the proposed methodology (i.e. approach to the study)
7. An acknowledgment that participants, data, and results will be treated ethically throughout the study
8. A timeline for the project

As Crawford, Burkholder, and Cox (2020) describe, these items can be split into separate portions of a research proposal, the rationale (i.e. Whye) and implementation (i.e. How).

### Rationale

As we discussed in previous chapters, developing a robust rationale for your research will help guide the entire research process. The introduction to your research proposal should include a general description of why the research should be conducted. Aside from your general interest, the introduction to the research should be firmly rooted in the available evidence which, first identifies a problem; second, identifies a purpose for the pursuit of inquiry into the problem; and finally, articulates a clear and focused research question which addresses the gap in current knowledge on the topic.

## Implementation

Outlining your plan for implementation is essential to gain approval to conduct your research. Equally important to developing a well-articulated rationale, the identification of a clear methodology for how you will implement your approach is an important component of a research proposal.

A plan of implementation can be presented in several ways. However, an inclusive plan should include the following elements (Crawford, Burkholder, & Cox, 2020):

- Design
- Methods
    - How you will select participants or identify 'what' is included in your investigation
    - How you will measure what you're investigating
    - What type of data you will collect and how
    - How you will analyze the data

- Delineators
    - Definitions
        - Frame the terms that specify your investigation
    - Assumptions
        - Qualities of the study that are inherent to the study, but may be overlooked as obvious unless addressed
    - Delimitations & Limitations
        - Delimitations narrow the scope of the study regarding what it does not include. Limitations are an acknowledgement of the weaknesses of the study design or methodology (Spoiler: there are limitations to EVERY study).
    - Significance
        - How does your research impact the field of inquiry? Does it:
            - Influence practice?
            - Impact policy?
            - Provide a foundation for future research?

We've spent a lot of time discussing how to identify a problem, a purpose, articulate a question, and identify a sample and the selection and implementation of an appropriate approach. Ethical considerations of the researcher is another essential topic for any researcher to cover. Here, we'll provide a general overview of ethical considerations that are required of sponsoring institutions to ensure the ethical treatment of study participants and related data.

## Ethics

As a clinician, you're likely familiar with the tenets of bedside bioethics that guide clinical practice:

- **Autonomy:** The right to self-direction and control
- **Beneficence:** The intention to do 'good', or what is in the best interest of the patient
- **Non-Maleficence**: The goal to 'do no harm' in practicing
- **Justice**: The pursuit of fairness and equity

These basic tenets of care do not change much when viewed through the lens of a researcher. However, it is important to note the foundation upon which research ethics were built. In 1974, the National Research Act was drafted in response to blatant abuse of research methods such as the Tuskegee study and resulted in the establishment of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research.The ethical principles which guide researchers are derived outlined by the Belmont Report (HHS.gov) and include:

- **Autonomy**: Respect for a person to make personal choices and provisions and protections to be provided for participants belonging to vulnerable populations
- **Beneficence:** The intention to do what is morally right; to minimize risk and maximize benefits
- **Justice**: To promote equity among the treatment of individuals and groups

Researchers must address the ways in which they intent to uphold these principles in their proposed research project. Methods by which they do this include:

- **Voluntary Informed Consent**: Informed consent is a

process which ensures that a participant is educated in terms that they can understand about the risks inherent to their participation. This process underscores respect through the provision of consent for a voluntary act (HHS.gov, n.d.)

- **Avoidance of Harm**: Avoidance of harm is related to the ethical tenet of beneficence and is the primary responsibility of the researcher
- **Assessment of Risk:** The common rule mandates that researchers ensure that the risk to potential participants in a research study are minimized and that the research cannot impose risk that outweighs the potential benefit of the outcomes.
- **Right to Withdrawal:** Participants must be made aware of their rights to withdraw from the study at any time, for any reason, without consequences.
- **Responsibility to Terminate:** The principle investigator has the responsibility to terminate the research intervention should it be made clear that the intervention has either a detrimental effect on participants or an overwhelmingly positive effect such that it would be unethical to continue the study.

Universal research practices which promote these principles must be included in a research proposal in order to conduct research at most institutions and are outlined in the Common Rule which regulates the functions of institutional review boards (IRBs).

## Institutional Review Board

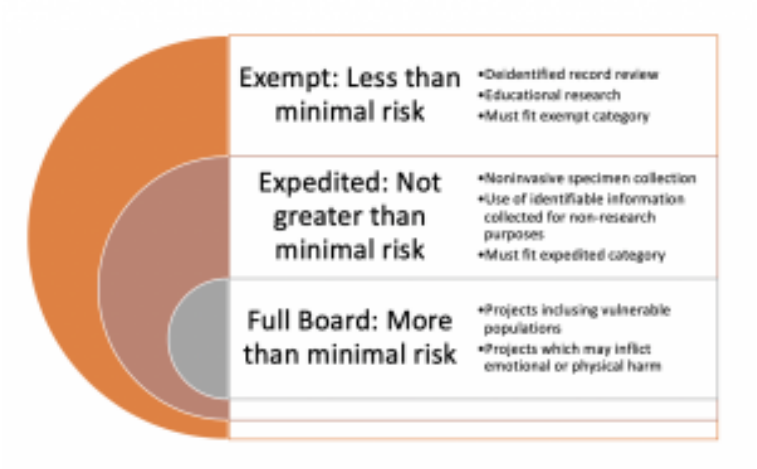
An IRB is a formally designated group which has been established to protect the rights and welfare of human subjects recruited to participate in research; specifically

research conducted at, or supported by, a specific institution. Here it is important to understand what is meant by the terms 'research' and 'human subjects'. In regards to the requirement of IRB review, the term **research** means a systematic investigation, development, testing and evaluation designed to develop or contribute to generalizable knowledge (University of Southern California, n.d.). **Human subjects** in relation to research refers to a living individual who's information or biospecimens are used or analyzed to generate either identifiable private information or biospecimens for the purpose of generalizable information (University of Southern California, n.d.).

Although there are some details which will differ between organizations, there are general categories of human subject research which must be reviewed by an IRB. These classifications are designated by the degree of risk assumed by the participants and the ability of the researcher to mitigate those risks. **Minimal risk** is described by the federal regulations as the probability and magnitude of physical or psychological harm that is normally encountered in the daily lives, or in the routine medical, dental, or psychological examination of healthy persons (Electronic Code of Federal Regulations, n.d). Generally, research proposals will fall into one of the following categories:

- **Exempt**: Exempt research poses no more than minimal risk to adult, non-vulnerable populations.
- **Expedited**: Research that poses no more than minimal risk to participants and fits into one of the expedited categories described in federal regulations 45 CFR 46.110 (HHS.gov)
- **Full Board**: Research that does not qualify for either exempt or expedited review and poses more than minimal risk to participants. This type of review requires the

approval from a full membership of an IRB.




*Categories and delineation of IRB Review*

## *Projects that don't need IRB approval*

Projects which are not considered human subjects research are not required to be reviewed by an IRB. Quality improvement projects do not typically require formal IRB review. However, individual institutional requirements should be reviewed and followed; preferably, in the planning phase of your research project to ensure that the requirements of your specific review align with both your approach and your timeline.

*Key Takeaways*

- Research proposals can be split into two primary components: The rational and the plan of implementation
- The introduction of your research proposal should encompass a description of your problem, purpose, and research question
- The identification of your research approach should be firmly guided by the ethical tenets of autonomy, beneficence, and justice
- The researcher has an ethical responsibility to protect participants from risk
- An institutional review board is a formal board charged with reviewing risks associated with research projects
- There are differing levels of institutional review; assumption of risk is the primary factor in classifying level of IRB review

## References

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# 7. Writing the Research Paper

Writing in a formal, academic, and technical manner can prove a difficult transition for clinicians turned researchers; however, there are several ways to improve your professional writing skills. This chapter should be considered a collection of tools to consider as you work to articulate and disseminate your research.

*Chapter 7: Learning Objectives*

This is it! You're ready to tell the world of the work you've done. As you prepare to write your research paper, you'll be able to

- Discuss the most general components of a research paper
- Articulate the importance of framing your work for the reader using a template based on the research approach
- Identify the major components of a manuscript describing original research
- Identify the major components of a manuscript describing quality improvement projects
- Contrast the specifications of guidelines and protocols

- Identify the major components of a narrative review

## Guiding Principles

Although it is wise to identify a potential journal or like avenue as you begin to write up you research, this is not always feasible. For this reason, it is a good idea to have an adequate understanding of the general expectations of what is required of written research articles and manuscripts. Here are some things to keep in mind:

### *Consider the articles you read*

As you begin to research potential research interests, pay close attention to the style of writing found in peer-reviewed and academic journals. You will notice that the 'tone' of 'voice' is often formal and rarely uses the first-person narrative. You will be expected to develop writing of this caliber in order to be published in a reputable peer-reviewed forum. One of the most difficult concepts for novice researchers to understand is that professional or technical writing is very different from casual or conversational writing. There is little room for anecdotes, opinions, or overly descriptive narratives. Keep your writing succinct and focused.

## *Keep it simple, silly! (KISS)*

Recall when you were first introduced to writing a paper in an early English Composition course. It is likely that you were told that the key components of a paper are the introduction, body, and conclusion. This is truly the foundational structure of any good paper. Consider the following outline for your writing assignments:

**Introduction**

- Brief overview of the topic which identifies the gap of understanding about a particular topic that you hope to address (why is it important?)
- Statement of problem (what issue are you going to address?)
- Purpose statement/thesis statement (what is the objective of this paper?)

**Body**

Typically the body of the paper will be broken down into themes or elements outlined in the introduction. Occasionally rather than themes or topics to be addressed, the 'body' of the paper will have specific components such as a literature review, methodology, data analysis, discussion, and/or recommendation section. Each of these sections may have specific requirements within that section. Later in this chapter, you will be introduced to specific requirements of different types of research papers.

The body of any paper is the 'meat and potatoes' of the work. That is, this is the section wherein you both present and explain your ideas in support of the purpose of the paper (described in the introduction). The body of your paper, regardless of specific structure, is where the majority of your evidentiary base should be included. That is, many of the statements you make in these sections will require substantiation from outside

resources. It is vital to include appropriate citations of all references used. To save yourself time, cite and reference correctly as you write. Doing so will help ensure that you stay organized as your work evolves.

Sections such as methods or data analyses, will not require as much substantiation and should be considered very 'cut and dry'. That is, there will be little to no discussion or interpretation of the evidence here. Results sections, similarly, should be focused on the presentation of results specific to your investigation, including statistical analyses. When reporting results of your work consider the format and whether it makes sense to summarize results in a table, figure, or appendix. The appropriate method will depend on both the type and amount of information that you are trying to convey.

The discussion section is the point at which you should frame your results in the context of your interpretation of the existing literature and how your work addresses the gap in knowledge. You'll work to substantiate your interpretation by utilizing references to present evidence to support your rational. Pay close attention to your approach as you discuss your results and the impact of your work. Be careful not to make declarative statements if your data does not support a cause-and-effect relationship. Additionally, be careful not to draw inference as a result of bias. That is, use caution in skewing the evidence to support your hypothesis.

**Conclusion**

The conclusion is exactly that. This is your opportunity to wrap your thoughts up succinctly. A good conclusion will remind the reader of the point or focus of the paper, reiterate the arguments outlined in the body as well as summarize any discussion or recommendations posed in those respective sections, and articulate what the content of the paper added to the knowledge base of the subject. This is not a time to introduce new arguments, concepts, or evidence. The reader should be able to finish the paper understanding the purpose

of the paper, the main arguments, and the impact of the work on the subject.

**References**

References should be cited correctly in text as well as appropriately formatted at the end of each body of work. The format of your references will depend on the guidelines required of the intended journal or forum you're submitting to. For example, papers written utilizing the American Psychological Association (APA) formatting standards will include reference pages which are organized on a separate page, titled 'References', and organized alphabetically by author surname. If you're not quite sure of where you'll be submitting your paper for publication, it may be best to write using APA format; because the references are listed in ascending alphabetical order, adding or removing references during the revision process will be minimally impactful on the designation of subsequent references. Altering your references can then be done once you identify a method of dissemination and review specific guidelines.

## Formatting

Understanding how to present your work can be difficult. It's one thing to plan and do the research; it's quite another to put it down on paper in a logical and articulate way. As we discussed in chapters 1 and 2, planning is essential to the success of your research. Similarly, planning the layout of your manuscript will help ensure that you stay both organized and focused. Although most articles can be generalized as having an introduction, body, and conclusion; the specific components within each of those sections varies depending on the approach to research.

## *Original Research*

Although many journals may outline specific requirements for how your manuscript or research paper is to be formatted, there are some generally acceptable formats. One of the most generalizable formats is referred to as IMRaD. IMRaD is an acronym and includes the following elements:

- Abstract
    - Most journals have specific word requirements for abstracts. However, abstracts should be a brief overview of the entire project such that if a reader were to only read the abstract, they would glean a good understanding of your research. Most abstracts are arranged to also follow the IMRaD format and amount of space spent on explaining each component can be estimated as:
        - Introduction- 25%
        - Methods- 25%
        - Results- 35%
        - Discussion/conclusion- 15%
- **I**ntroduction/Importance
    - Clearly state the focus for the work. Provide a brief overview of the issue and the gap in knowledge identified; including both a problem and purpose statement in the context of what is currently understood about the topic. This is where you 'reel' the reader in and also highlight the important themes which are consistently addressed in the existing literature.
- **M**ethods
    - Describe both the general and specific approach taken in your work. This section is usually written with a very technical approach and includes sections such

as:

    - General and specific approaches
    - Participant selection/randomization
    - Instrumentation/measurements utilized
    - Procedure
    - Analysis
- **R**esults and
    - Here is where you report specific findings and outcomes of your work. There should be very little discussion in this section. Rather, you should present your results and comment, briefly, on how this may relate to the existing literature and state the bottom line. That is, what do these findings suggest. These succinct comments should frame the lens of the discussion section.
- **D**iscussion
    - In the discussion section you can further elaborate on your interpretation, based in the evidence, of how your findings relate to what other researchers have found. You can discuss flaws in your work as well as suggestions for direction of future research. You should address each of the main points you presented in your introduction section(s).

## *QI Projects*

When presenting your QI project; a systematic reporting tool, such as the SQUIRE method, is helpful to ensure that you appropriately present the information in a way that both adds to the understanding of the problem as well as a descriptive approach to solving the issue.

SQUIRE Method

Titling your QI project

- Your title should indicate that the project addresses a specific initiative to improve healthcare.

*Example of QI Project title*

Quality Improvement Initiative to Standardize High Flow Nasal Cannula for Bronchiolitis:Decreases Hospital and Intensive Care Stay

- Addresses specific initiative to improve healthcare
- Directly identifies the bounds and focus of the project

1. Abstract

    - Provide enough information to help with searching and indexing of your work
    - Summarize all key findings in the format required by the publication. Typical sections include background (including statement of the problem), methods, intervention, results, and conclusion

2. Introduction (Why did you start?)

    - Include a description on the nature and significance of the problem
    - Review of available knowledge

        - Summary of what is currently understood about the problem
    - Rationale
        - Overview of framework, model, concepts and/or theory used to explain the problem. Include an assumptions, delimitations, or definitions used to both describe the problem as well as develop the intervention and why the intervention was intended to work.
    - Specific aims
        - Describe the purpose of the project

4. Methods (What did you do?)

    - Context
        - Describe the contextual elements relevant to both the problem and intervention (e.g. environmental factors contributing to the problem)
    - Intervention(s)
        - Describe the intervention in enough detail that it could be reasonably replicated
            - Include team-based approach, if applicable
        - Study of the Intervention
            - Describe the approach used to assess the impact of the intervention as well as what approach was used to evaluate/assess the intervention
        - Measures
            - What tools did you use to study both the process and intervention and why?
            - What tools are in place for ongoing assessment of efficacy of the project?
            - How is completeness and accuracy of the data

measured?
    - Analysis
        - Describe the quantitative/qualitative methods used to draw inference from the data collected
    - Ethical Consideration
        - Describe how ethical considerations were addressed and whether the project was overseen by an Institutional Review Board (IRB)

5. Results (What did you find?)

    - Initial steps of intervention and evolution over time; including modifications to the intervention or project
    - Details of the process measures and outcome

6. Discussion (What does it mean?)

    - Summary
        - Key findings including relevance to the rational and specific aims
        - Strengths of the projects
    - Interpretation
        - Nature of the association between intervention and outcome
        - Comparison of the findings with those of other publications
        - Impact of the project
        - Reasons for differences between observed and anticipated outcomes; include contextual rationale
        - Costs and strategic implications
    - Limitations

        - Limits to the generalizability of the work
        - Factors that may have limited internal validity (e.g. confounding variables, bias, design)
        - Efforts made to minimize or adjust for limitations
    - Conclusion
        - Usefulness of the work
        - Sustainability
        - Potential for application to other contexts
        - Implications for practice and further study
        - Suggested next steps

7. Funding*

    - This section would be included if you received funding for the projects.

## *Narrative Reviews*

As mentioned in chapter 2, development of either guidelines or protocols is an intensive process which often requires a systematic team approach to ensure that the scope and purpose of the work is as generalizable as possible. The best approach for the development of guidelines can be found by reviewing the World Health Organization handbook for guideline development.

Presenting a narrative review of a topic is an excellent way to contribute to the knowledge base on a particular subject as well as to provide framework for development of a protocol or guideline. The elements included in presentation of a narrative review are not all that different from those of traditional research studies; however, there are some notable differences. Here is a brief outline of what should be included in a quality narrative review, adapted from Green, Johnson, and Adams (2006) and Ferarri (2015):

1. Title
2. Structured Abstract
    1. Green, Jonhson, and Adams (2006) describe the components of a structured abstract in the context of a narrative review to include

        - **Objective:** State the purpose of the paper
        - **Background:** Describe why the paper is being written; include problem statement and/or research question
        - **Methods:** Include methods used to conduct the review; including those used to evaluate articles for inclusion into your work
        - **Discussion:** Frame the findings of the review in the context of the problem
        - **Conclusion:** State what new information your work contributes as a result of your review and synthesis
        - **Key words:** List MeSH terms and words that may help organize and/or locate your work

3. Introduction
    1. Clearly state the focus for the work. Provide a brief overview of the issue and the gap in knowledge identified; including both a problem and purpose statement
4. Methods
    1. Provide an overview of how information related to the review was located. This includes what terms were searched and where as well as why studies were included in your review. Delimiting your search is important to describe the scope of the review
5. Body
    1. Themes or constructs should be identified throughout

the review of the literature and arranged in a way such that the discussion of the theme and the link to the evidence should directly address the purpose of your inquiry

2. Discussion
    1. What sets a review apart from an annotated bibliography is synthesis of the evidence around major points identified consistently throughout the research (i.e. themes). Both consensus and diverging approaches should be included in the discussion of the evidence. This should not be considered simply a comparison of the existing evidence, but should be framed through the lens of the author's interpretation of that evidence.

6. Conclusion
    1. Tie back to the purpose as well as the major conclusions identified in the review. No new information should be discussed here, apart from suggestions for future research opportunities

## *References*

An extremely important part of disseminating your work is ensuring that you have correctly attributed thoughts and content that you did not create. Depending on the nature of your research, discipline, or intended publication, the format by which you list your references or outline resources utilized may differ. Regardless of referencing formatting guidelines, it is imperative to keep your references organized as you draft different iterations of your work. For example, it may be easier to draft your work utilizing American Psychological Association (APA) formatting guidelines, which arrange references by author's last name, in ascending alphabetical order, than in other formats which require that references be numbered in

order of appearance in the text. As you add, delete, or rearrange references within the text of your manuscript, it may be both difficult and time consuming to constantly re-number each of your references. **Note**: Depending on the reference guidelines for your intended journal, you may be required to list the abbreviated names of journals. Finding this information can be difficult. Consider this resource for locating and identifying how best to list journal titles within a reference.

*Key Takeaways*

- Identifying an appropriate outline for the research approach you selected is essential to developing a publishable manuscript
- Academic writing is formal in both voice and tone
- Academic writing is technical
- Refrain from the use of the first person narratives, including anecdotes, or interjecting your unsubstantiated opinion
- All research papers have an introduction, body, and conclusion
- Specific components of the introduction and body will vary depending on the approach
- Proper citation, referencing, or attributing must be included in all work

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This is where you can add appendices or other back matter.