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Part 1
The 7 Steps of Data Analysis: Introduction

The Background of this Textbook

Who Was This Book Written For?

This book was originally written for people who find themselves in a somewhat peculiar situation, which I found myself in many years ago. The situation I am referring to is graduate school. Often a graduate student enrolls in a program to study a subject other than statistics, but finds that in order to graduate his/her chosen program he/she must learn, understand, and even conduct data analysis. This is a common occurrence in clinically-based advanced degree programs, such as medicine, nursing, and social work. Understanding and properly using statistics becomes especially important when the program requires the completion of a thesis or dissertation based on a data analysis project.

Regarding my own situation, I enrolled in a Masters of Social Work (MSW) program with the intention of becoming a clinician. The first semester of this program included a required foundational course in Social Work Research and Statistics. Within the first month of beginning this course I noticed that I was keenly interested in the subject matter. The professor of the course told me I had been bitten by the “research bug.” Soon after that I realized that if there was a “research bug” it seemed to bite only a few graduate students, while it just annoyed the rest.

I noticed that the majority of graduate students in this clinically-based program were not getting a great deal of knowledge, fulfillment, or enjoyment from their study of research and statistics. Certainly, most were not grasping how the statistical procedures they were learning could be organized toward completing a data analysis study. This left students anxious and frustrated, with a negative attitude toward research and statistics, which then prompted me to ask the question:

“How can I make data analysis more understandable, meaningful, and enjoyable for advanced degree students in clinically-based programs?”

After years of both learning data analysis and pondering the condition of my fellow students, I came up with an answer: Break the Data Analysis Cycle of Inner-Knowledge.
The Data Analysis Cycle of Inner-Knowledge

You may wonder not only what is the Data Analysis Cycle of Inner Knowledge is, but also how did I arrive at it? Let me explain the process. Early on, even though I graduated a clinically focused program, I decided to become a statistician. Years later, after working on a great many studies, I not only succeeded, but realized something extraordinary.

Seemingly, every successful statistician and data analyst had to figure out the steps they needed to take and the procedures they needed to include toward producing a professional level data analysis study. This deduction was largely done through a combination of advice from mentors, learned coursework, and trial and error. Soon after I developed this knowledge I recognized the there was a peculiar cycle where this knowledge was kept in a sort of inner circle of statisticians and data analysts. Specifically, what I recognized is that:

Once a statistician or data analyst figures out how to conduct an effective data analysis he/she largely continues to apply this knowledge in his/her craft, but almost never shares this knowledge with anyone else. Thus, I recognized what I termed The Data Analysis Cycle of Inner-Knowledge.

Thus, I realized that although not intentionally, there was a key piece of information privy to a relatively small circle of data analysts and statisticians, but not to the mass of professionals in the research and practice world. It was as if one had figured out the secret to being rich, but was too busy enjoying his/her money to remember to share the secret with people that were not yet rich.

I also realized that if this knowledge was published and related effectively, it could bring a great many professionals to the level of being effective data analysts. Essentially, the years of mentor advice, coursework, and trial and error needed to become an effective data analyst could be delivered to these professionals rather quickly and effectively. Furthermore, the mass of graduate students that felt that statistics were a confusing conglomeration of meaningless procedures would realize that statistical tests are a useful part of a larger process of data analysis. Additionally, those students that needed to complete a data analysis for a thesis or dissertation type project would also have an instructional roadmap on how to complete this procedure.

Thus, the goal of this book is to present, review, and share the seemingly arcane stepwise process of data analysis in a new and interesting manner that is easy to understand and even more importantly easy to implement. The key to this goal can be expressed in one word: essentials.
The Key to Data Analysis: Knowing the Essentials

The key to conducting data analysis effectively and efficiently rests with the realization that:

The Mind Retains a Limited Number of Essential Facts

Perhaps it is just human nature or a quality of the mind, but the mind seems to break large constructs down to and retain a small number of essential facts no matter what the topic. For example, consider the knowledge most people have of the Bible. The average person could probably not tell you small details such as the number of books in the Bible, all of the animals on Noah’s Ark, or the name of Moses’ mother. However, the average person would very likely be able to tell you the number of commandments specified in the Bible. Thus, you have a large text full of advice, lessons, and stories, but the mind retains a small number of essential rules.

If we accept the premise that the mind is most likely to retain a small number of essential rules, then perhaps the most effective method of learning data analysis would be to specify and review the essential guidelines of data analysis. Certainly in my experience knowing these guidelines is the key to making data analysis understandable, implementable, and enjoyable.

In this text we will identify, review, and apply two guidelines.

Guideline 1: There are 7 Must Know Facts

Guideline 2: There are 7 Steps to Data Analysis

Knowledge of these 7 Must Know Facts and 7 Steps to Data Analysis will provide a foundation for learning, interpreting, and conducting data analysis.

Creating a Foundation to Build On

Obviously, data analysis is an intricate process that takes years to master. The purpose of this book is not to turn you into a master of data analysis overnight, but to lay a foundation for gaining an ever increasing mastery of the subject. The text is predicated upon the belief that if one develops an essential foundational knowledge of data analysis, one can always add to that knowledge. However, if one does not develop an understanding of the fundamentals, then there is nothing to build upon.

Therefore, this text does not go into great detail about every small nuance regarding each topic mentioned. I have found that this approach makes the text exceedingly dense and overshadows the central message being presented. Instead, this text covers the major topics and concepts associated with data analysis. Readers are certainly encouraged to gain a greater depth
of knowledge regarding these topics after completing this text. To put it succinctly:

**I try not to focus too much on the details, so we can clearly present the essentials**

It is also worth mentioning that one of the biggest challenges in learning data analysis is not that there is an unavailability of materials on a topic. Today, most topics are covered rather well by online materials. The challenge rests in the fact that most people are unaware of what topics they need to gather information upon.

For example, in order to determine how many study participants are needed for a data analysis study, you would conduct a procedure know as a power analysis. If you know this fact, you can identify many resources that will explain this procedure upon arriving at this particular point in your study. However, if you do not know the term for the procedure (power analysis), you may have difficulty gathering information on the topic. Worse yet, if you are not informed of the procedure, you may not even realize that there is a requisite number of study participants for a data analysis at all.

Through presenting the major facets, facts, and figures of data analysis, this text will provide you with a great number of the essential terms, concepts, and basics you need to know to understand and/or conduct a data analysis study.

**As Pragmatic as Possible**

Lastly, this book is written with the intention of being as pragmatic as possible. Simply put, along with the conceptual information, the text includes instruction on how to conduct each procedure in statistical software, as well as how to effectively interpret the statistical output. The statistical software program SPSS is used, as that seems to be the most popular and widely used data analysis program.

I have attended a great many lectures where I felt the information presented was spectacular and I was excited to apply the information once I got back to my desk. However, I often found that once I sat down to apply the newly learned information, I could not figure out how to do so. Subsequently in this text, information is not only presented, but also applied in detail.
What is Data Analysis?

This book is written with the intention of instructing the reader on how to learn, understand, interpret, and conduct data analysis. That may prompt you to ask, what is data analysis? If you ask the average person what data analysis is, you are likely to get the response “statistics.” While statistics are the primary tool used in data analysis, statistical tests and procedures actually only comprise a segment of data analysis.

You could say that statistical tests and procedures are to conducting a data analysis, what lyrics and notes are to composing a song. Lyrics and notes must be ordered in a proper and specific way in order to produce a well made song. Simply having a set of lyrics and notes without the knowledge of how to order each properly into a song makes those lyrics and notes of little use.

For example, please note the two boxes below. Each box contains the same musical lyrics. However, the lyrics within the box on the left are not properly ordered in terms of the song from which they are borrowed. Subsequently, these lyrics are disorganized, unclear, and will most likely not deliver the message they are meant to convey.

The lyrics within the box on the right are properly ordered in terms of the song from which they are borrowed (the classic song *A Hunk of Burning Love* by Elvis Presley). Subsequently, these lyrics are organized, clear, and will deliver the message they are meant to convey.

Now the question begs, what is the difference between the two boxes? Put simply it is only that the tools (i.e., musical lyrics) were and were not ordered properly for use. When ordered properly, the tools are powerful! When not ordered properly, the tools are of no substantial use.

<table>
<thead>
<tr>
<th>TOOLS: MUSICAL LYRICS</th>
<th>TOOLS: MUSICAL LYRICS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Not Ordered Properly RE Song</strong></td>
<td><strong>Ordered Properly RE Song</strong></td>
</tr>
<tr>
<td>1) Just a hunk, a hunk of</td>
<td>1) Cause your kisses lift me higher</td>
</tr>
<tr>
<td>2) Like the sweet song of a choir</td>
<td>2) Like the sweet song of a choir</td>
</tr>
<tr>
<td>2) My morning sky</td>
<td>3) You light my morning sky</td>
</tr>
<tr>
<td>3) Cause your kisses</td>
<td>4) With burning love</td>
</tr>
<tr>
<td>4) You light</td>
<td>5) I’m just a hunk, a hunk of burning love</td>
</tr>
<tr>
<td>5) Lift me higher</td>
<td>6) Just a hunk, a hunk of burning love</td>
</tr>
<tr>
<td>6) Burning love</td>
<td></td>
</tr>
</tbody>
</table>
The same is true regarding data analysis. Specifically, as in a song, when conducting data analysis the tools must be ordered properly to produce a study that is organized, clear, and delivers an accurate message. However, unlike a song, in data analysis the tools are not lyrics, but statistical tests and procedures. Knowing how to properly organize these statistical tests and procedures is key to conducting an efficient data analysis.

The knowledge of how to properly order statistical tests and procedures toward conducting an effective data analysis is almost like a missing link in the world of quantitative research. For some reason, this information is barely ever spoken, taught, or presented. Over the years it has become rather obvious to me that this lack of awareness is perhaps the biggest barrier to learning, understanding, teaching, and conducting effective data analysis across many fields.

Traditionally, statistical tests and procedures are taught in a series of academic courses. Thus, while a student or academic may gain proficiency in each statistical procedure, he or she may remain unaware of how these statistical procedures should be properly ordered toward conducting an effective data analysis study. In other words, he or she has learned the statistical procedures, but not how to use them in tandem toward conducting a data analysis study.

As an example, please note the two boxes below. Let’s assume that after attending three different academic courses a student learned the four statistical procedures listed in the box below to the left (i.e., Frequencies, T-test, Multiple Regression, & Power Analysis). While the student may have gained knowledge of these statistical procedures, he or she may still not know how to apply these procedures together toward conducting a data analysis study.

In order to fully apply the four statistical procedures in a data analysis study, the student would need the information in the box below on the right hand side, The 7 Steps of Data Analysis. Through ordering the procedures within these 7 steps (as listed in this box), we have a roadmap of how to properly order and apply each statistical procedure toward conducting an effective data analysis study.

<table>
<thead>
<tr>
<th>LIST OF STATISTICAL PROCEDURES</th>
<th>LIST OF STATISTICAL PROCEDURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>RE: No Order for Use</td>
<td>RE: The 7 Steps of Data Analysis</td>
</tr>
<tr>
<td>1) Frequencies</td>
<td>1) Create a Study Map</td>
</tr>
<tr>
<td>2) T-test</td>
<td>2) Enter/Clean/Code Data</td>
</tr>
<tr>
<td>3) Multiple Regression</td>
<td>3) Check Data Integrity [Power Analysis]</td>
</tr>
<tr>
<td>4) Power Analysis</td>
<td>4) Univariate Analysis [Frequencies]</td>
</tr>
<tr>
<td></td>
<td>5) Bivariate Analysis [T-test]</td>
</tr>
<tr>
<td></td>
<td>6) Multivariate Analysis [Multiple Regression]</td>
</tr>
<tr>
<td></td>
<td>7) Write-up &amp; Report.</td>
</tr>
</tbody>
</table>
**Just Remember!**

Being able to properly order statistical tests and procedures is as important to data analysis as being able to properly order musical lyrics is to a song!

*Hey, You Still Have Not Told Us What Data Analysis is!*

Essentially, data analysis is applying a series of statistical tests and procedures in a specific stepwise progression in order to examine a dataset. In other words, data analysis is taking a set of tools (statistical tests/procedures) that when applied in a certain order (the 7 Steps of Data Analysis) reveal the message(s), lesson(s), and answer(s) the data have to tell us.

*Stop Right There!*

On second thought, let’s halt our hard discussion on the components of data analysis. Why? Because the foundational nature of this textbook suggests data analysis might be foreign to the reader. Therefore, perhaps a more effective discussion might focus on how the components of data analysis are similar to another process already familiar to the reader, such as making a cake.

**The Components of Data Analysis**

(A.K.A, If Data Analysis is More than You Can Take, Think of It as Making a Cake)

Yes, the components involved in making a cake are almost identical to those of conducting a data analysis study. Therefore, to make the lesson easier, we will present how the components of making a cake are related to the components of conducting a data analysis study.

My hope is that this parallel will make the concept of data analysis much more “digestible.”

Subsequently, let’s first talk about the components of making a cake.

*Making the Cake*

Just to keep it simple, let’s say you need four things to make a cake. Specifically, you need:

1) **The Cake Recipe**: An *outline of the steps to follow* toward making that cake. To be practical, I suggest a recipe is simply a “to do” list that presents a series of steps that must be taken in a precise order.

2) **The Cake Ingredients**: The *materials* necessary to produce the cake.

3) **Cooking Utensils**: The *tools* to transform the ingredients into the finished product.

4) **Baking Secrets**: The famous *Must Know Facts* that every baker seems to have that while might not be stated definitively, are essential to consider while making a cake.
Conducting the Data Analysis Study

Well, to conduct a data analysis study, you need the equivalent of these four things. Specifically you need:

1) **The 7 Steps of Data Analysis**: An *outline of the steps to follow* toward conducting a data analysis study. Like a recipe, I suggest The 7 Steps of Data Analysis is also simply a “to do” list that presents a series of steps that must be taken in a precise order (Your *recipe* for a data analysis study).

2) **The Study Variables**: The *materials* necessary to produce a data analysis study (Your *ingredients* for a data analysis study).

3) **Statistical Tests and Procedures**: The *tools* to transform the data into the finished product (Your *utensils* for a data analysis study).

4) **The 7 Must Know Facts of Data Analysis**: The *Must Know Facts* that while might not be stated definitively very often, are essential to conducting a data analysis study (Your “secrets” to conducting a data analysis study).

_Let’s Examine These Parallels a Bit More Closely…_

_The Cake Recipe = The 7 Steps of Data Analysis_

As we suggested, you could think of a completed data analysis study like a completed baked good, like a cake. The data analysis study and cake are both finished products that were created by following a “to do” list. Regarding the cake, the list of things that must be done is called a recipe. Regarding the completed data analysis study, the list of things that must be done is called The 7 Steps of Data Analysis.

On the top of the next page you will see a side by side comparison of how the cake recipe and 7 Steps of Data Analysis present a list of steps that must be followed and completed in a certain order to produce the respective final product. Now, of course each step within The 7 Steps of Data Analysis involves many other steps and considerations. However, each data analysis study can be approached using this “to do” style list toward completing an efficient analysis.

In this text, The 7 Steps of Data Analysis are described in **Section 1**, then applied toward conducting sample study 1 in **Section 2**, then sample study 2 in **Section 3**. Finally, in **Section 4** of this text, we will see how The 7 Steps of Data Analysis can be used to assess the quality of other published research utilizing quantitative methods.
The cake is created using materials, known as ingredients. The word “ingredients” is really just a catch all phrase. The materials known as ingredients have specific names and qualities, such as butter and flour. Furthermore, different cakes require different types, amounts, and combinations of these materials. In other words, each cake has specific needs regarding the necessary ingredients used to make that cake.

The data analysis study is conducted using materials, known as data. The word “data” is really just a catch all phrase. The materials known as data are structured as variables. In other words, data are a set of variables. Each variable has a specific name and quality. For example, sample study 1 in this book examines the variable Happiness (variable name). Happiness is defined as a feeling of well-being and elation (variable quality). Obviously, different studies require different types, amounts, and combinations of these variables. For example, a data analysis study examining happiness requires the inclusion of the variable Happiness.

In a data analysis study, the study variables must exist in at least two places. First, the study variables exist within the software database (e.g., SPSS) where the responses of study participants (taken from study surveys) are recorded and housed as study variables.

Second, the study variables, just like cake ingredients, are also regularly presented as a list. We can see in the box to the left below that there is a list of 7 cake ingredients that we must have in order to compose our cake. Similarly, in the box below to the right, we can see that there is a list of 4 study variables that we must have to compose out study. In the case of each, it is essential to have all necessary materials listed before approaching the project.
By the way, we are skipping an important step for the sake of brevity. Specifically, at this point we would also clean the data and perform checks of data integrity. This will be discussed at length later in the text. This also relates to making a cake as any baker “worth his/her salt” would also clean his or her ingredients and be sure to check the quality of each.

<table>
<thead>
<tr>
<th>MATERIALS: MAKING A CAKE</th>
<th>MATERIALS: DATA ANALYSIS STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Cake Ingredients</strong></td>
<td><strong>The Study Variables</strong></td>
</tr>
<tr>
<td>1) 1 Cup of White Sugar.</td>
<td>1) Dependent Variable: Happiness.</td>
</tr>
<tr>
<td>2) ½ Cup of Butter.</td>
<td>2) Independent Variable: Do You Live with a Cat or Dog?</td>
</tr>
<tr>
<td>3) 2 Eggs.</td>
<td>3) Covariate Variable: Education.</td>
</tr>
<tr>
<td>4) 2 Teaspoons Vanilla Extract.</td>
<td>4) Covariate Variable: Income.</td>
</tr>
<tr>
<td>5) 1 ½ Cups All Purpose Flour.</td>
<td></td>
</tr>
<tr>
<td>6) 1 ¾ Teaspoons Baking Powder.</td>
<td></td>
</tr>
<tr>
<td>7) ½ Cup of Milk.</td>
<td></td>
</tr>
</tbody>
</table>

**Cooking Utensils = Statistical Tests and Procedures**

After a baker has identified a cake recipe to follow and has the cake ingredients ready, he or she must now employ specific tools, known as cooking utensils, to relate the ingredients to one another toward producing that final product (a cake). For example, within the cake recipe, step 3 instructs “cream together sugar and butter.” The term “creaming together” means beating the ingredients together in one bowl until blended smooth. In the box at the top of the next page to the left we can see that in order to relate the ingredients Sugar and Butter, we need a cooking utensil known as a hand mixer.

In the same box, we also see that in order to relate the ingredient Eggs to the overall mixture, we need a cooking utensil know as a Whisk (step 4). Finally, in order to relate the ingredients Vanilla and the overall mixture, we need a cooking utensil known as a large spoon (step 5).

Similarly, once a data analyst has followed The 7 Steps of Data Analysis and has the study variables ready, he or she must now employ specific tools, known as statistical steps and procedures, to relate the study variables to one another toward producing that final product (a completed data analysis study). For example, in a data analysis study, such as sample study 1 in this text, we want to identify which of the three study variables Education, Do You Live with a Cat or Dog?, and Income, is significantly related to our dependent variable Happiness. So what tools do we need to do this?
We can see in the box below to the right, that if we wanted to relate the study variables *Happiness* and *Education*, we use a statistical test known as an ANOVA. If we want to relate the study variables *Happiness* and *Do You Live with a Cat or Dog?* we use a statistical test known as a T-test. If you want to relate the study variables *Happiness* and *Income* you use a statistical test known as a Correlation. Simply put, there is a right tool for each job. This text will review in detail how to select the right tool for each job.

<table>
<thead>
<tr>
<th>TOOLS RELATING: INGREDIENTS</th>
<th>TOOLS RELATING: STUDY VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingredients Related</td>
<td>Study Variables Related</td>
</tr>
<tr>
<td>Cream Together</td>
<td>Happiness &amp; Education</td>
</tr>
<tr>
<td>Sugar and Butter</td>
<td>Happiness &amp; Do You Live with a Cat or Dog?</td>
</tr>
<tr>
<td>Beat the Eggs Into the Mixture</td>
<td></td>
</tr>
<tr>
<td>Stir Vanilla in with the Other Ingredients</td>
<td>Happiness &amp; Income</td>
</tr>
<tr>
<td></td>
<td>Correlation</td>
</tr>
<tr>
<td>Cooking Utensil Used</td>
<td>Statistical Test Used</td>
</tr>
<tr>
<td>Hand Mixer</td>
<td>ANOVA</td>
</tr>
<tr>
<td>Whisk</td>
<td>T-test</td>
</tr>
</tbody>
</table>

*Baking Secrets = 7 Must Know Facts of Data Analysis*

It seems that eventually every great baker begins to formulate certain baking “secrets” that become an integral part of his or her baking process. These secrets are guidelines that although not stated definitively in the recipe, are essential for the baker to keep in mind while he or she conducts his or her craft. For example, we see in the box on the top of the next page to the left, several secrets a baker might apply to the baking process, such as using shiny metal pans or only filling pans halfway.

Like a baker, a data analyst in time also begins to formulate certain “secrets” in conducting his or her craft. These secrets are guidelines that are often not definitively stated in a text, but are essential to keep in mind while conducting or reading a data analysis study. In this text, these guidelines are presented as the 7 Must Know Facts of Data Analysis.

On the top of the next page, in the box to the right, there is a listing of the 7 Must Know Facts of Data Analysis. These facts are global rules and concepts of data analysis that are essential to understanding the process, such as how to select the correct statistical test (Must Know Fact 5). These 7 Must Know Facts are discussed in detail in **Section 1** of this textbook.
Why Statistics Are Awesome

In the last section we described how statistical tests and procedures are the primary tools used in data analysis. But, just what are statistics and why are they awesome as the title of this section suggests? The response to both questions is because statistics are tools that help us:

Understand the Reality Around Us in a Way We Could Not Otherwise!

Statistics offer us a means of unearthing knowledge about the world we live in that otherwise would remain hidden. Specifically, at its core, statistical procedures are methods of measuring the world around us as variables (e.g., Happiness or Education) and then testing the association(s) between those measured variables (e.g., Is Happiness associated with Your Highest Level of Education?). These measured variables are largely undetectable with the other five senses of touch, taste, smell, sight, or hearing. However, we can measure these variables empirically toward producing a portrait of these unseen aspects of the world around us.

For example, let’s say there is a crowd of 100 people all together at a restaurant. While we are waiting for a table we begin to wonder if among this group, the people with Graduate School Degrees have a higher level of Happiness relative to all other patrons who Do Not Have Graduate School Degrees. Could you use your sense of touch, taste, smell, sight, or hearing to effectively observe if the relationship between variables exists (i.e., variable 1: Do or Do Not Have a Graduate School Degree & Variable 2: Happiness)? Not really, but if you provided each

### Baking Secrets
1. Use Shiny Metal Pans
2. Use Properly Sized Pans
3. Heat the oven 10-15 Minutes Extra
4. Measure Ingredients Accurately
5. Don’t Overbeat/Underbeat Batter
6. Fill Pans Halfway
7. Carefully Space Pans in Oven

### 7 Must Know Facts of Data Analysis
1. Don’t Believe the Hype, Never Instantly Accept the Statistics You See In Type
2. You Need a Study Map to avoid Each Data Analysis Pitfall and Trap
3. Examine Your Data in 3D, If You Want to Understand Them Completely
4. When Specifying the 7 Steps of Your Data Analysis Plan, from Study Map to Write-Up & Report they Should Span
5. When Selecting the Correct Statistical Test, Variable Structure Will Guide You the Best
6. There are 3 Aspects of a Relationship, You Must Consider All Three to Get a Grip
7. In Data Analysis There Are Essential Values, the 80-20 Rule Will Give You the Clues
table with an empirical measure of *Happiness* and highest level of *Education* you certainly could! In this way statistics are like a sixth sense!

**Is that Not Far Out, Cool, and Off the Hook?**

Statistics can also be used to understand the reality of your home life. For example, let’s say you are married and you notice that each time you compliment your spouse in the morning he/she cleans the house that evening. Soon you get tired of wondering if there is an association between this complimenting and cleaning scenario and you want hard-core proof.

Subsequently, you begin to gather data toward producing a better picture of what is really going on at home. Over the next 100 days you compliment your spouse once in the morning for 50 days and do not compliment him/her for the other 50. You then count the number of times your spouse has cleaned the house on the days that you did and did not compliment him/her. You might put these numbers in a small table like this:

<table>
<thead>
<tr>
<th>Gave a Compliment</th>
<th>Cleaned the House</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>20%</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>95%</td>
</tr>
</tbody>
</table>

You can see in the table that on the mornings where you did compliment your spouse he/she cleaned the house 80% of the time. Furthermore, on the mornings you did not compliment your spouse he/she only cleaned the house 5% of the time. Now you have actual numerical values, or statistics, that better reflect the reality of your home life. By the way, the numbers indicate that your spouse cleaned the house on a much higher percentage of the days you paid them a compliment (80%) relative to the days you did not pay them a compliment (5%), which might suggest a relationship.

An example like this could just as easily be generalized into one’s professional role. For example, if you were a nurse and had a patient that did not like to take his/her daily medication, you could set up the same experiment to determine if your complimenting the patient had an association with the percentage of time he/she took his or her medications (please see table below).

<table>
<thead>
<tr>
<th>Gave a Compliment</th>
<th>Patient Took Medication</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>20%</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>95%</td>
</tr>
</tbody>
</table>

Again, these same numbers indicate the patient took his or her medication on a much higher percentage of the days you paid them a compliment (80%) relative to the days you did not pay them a compliment (5%). This would again suggest a relationship between complimenting the patient and his or her taking medication.
To reiterate, using these example we can see that the two primary activities employed through statistics are: 1) Measuring Variables (e.g., in the first example, complimenting your spouse and cleaning the house); and 2) Testing the Association(s) between those Measured Variables (e.g. in the first example, the relationship between complimenting your spouse and cleaning the house). And of course we have indicated that through statistics we can see reality in a deeper and more meaningful way than we could otherwise!

**Applying the Materials**

So far in this introduction we have discussed a great deal. We have talked about what a data analysis study is by definition. We have described the components of a data analysis study. We have also gone so far as to describe the tools used within a data analysis study (i.e., statistics) and how each procedure must be ordered properly. This is all valuable information. However, I must point out that in order to truly learn about conducting data analysis you must do more than just read about the topic. To learn about conducting data analysis study you need to apply the information and experience the process.

Don’t get me wrong! I believe our discussion of data analysis up this point has been worthwhile. And yes, I believe the materials in Section 1 that present The 7 Steps of Data Analysis and the 7 Must Know Facts of Data Analysis are essential to conducting quantitative research. However, it is what you will encounter in Sections 2, 3, and 4 that will make data analysis a reality for you!

*Oh My Goodness! What Happens in Sections 2, 3, and 4?*

In Sections 2, 3, and 4, you will actually apply the 7 Steps of Data Analysis and the 7 Must Know Facts of Data Analysis toward completing two sample research studies and assessing the quality of published quantitative research. Why? Most of us would likely agree that learning new and interesting information can be a worthwhile pleasure.

However, most of us have also had the experience of learning seemingly useful information, only to discover that we can’t figure out how to apply it! It seems that at some point we all realize that there is often a huge gap in between knowing great information and knowing how to apply that great information. Therefore, in this textbook, we will move beyond the presentation of knowledge into the application of knowledge!

You will see outlined in detail below that we will apply The 7 Steps of Data Analysis and the 7 Must Know Facts of Data Analysis in three instances. First, in sample study 1, we will apply this information toward completing a data analysis study examining a continuous dependent variable (Section 2). Next, in sample study 2, we will apply these materials toward completing a data analysis study with a dichotomous categorical dependent variable (Section 3). Please note the description of how these studies are conducted in detail toward serving as templates for you when you must conduct your own original data analysis projects.
Keep in mind all analysis is presented instructionally in the SPSS software

You may ask why two sample studies are presented instead of just one. Here, it is important to realize that a some of the statistical procedures and details involved in a data analysis study will vary when the dependent variable used is measured on a continuous scale (e.g., measured on a scale of 1-10) or categorical scale (e.g., Yes or No). Therefore, in this text we conduct a sample studies with each type of dependent variable. Through presenting a walkthrough of how to conduct each type of study, the reader will be better equipped to conduct each type of analysis in the real world. This a great advantage as the overwhelming majority of data analysis studies include either a continuous or dichotomous categorical variable.

After reviewing our two sample studies, we illustrate how we will use The 7 Steps of Data Analysis and the 7 Must Know Facts of Data Analysis to assess the quality of other published data analysis studies, such as peer-reviewed journal articles and research reports (Section 4). Most people feel a bit lost assessing these types of publications, but are uncertain why. I found that in order to competently assess quantitative research, you need to know what should be included and presented in the report before you read the article. However, most people have no idea of what should be included, so they are unsure if the article presented all the appropriate materials. You will see that when we apply The 7 Steps of Data Analysis to a published data analysis study, we will be able to assess quite quickly if the article has included all necessary information.

Please note the three outlines below, which describe the projects we will use to illustrate how to apply The 7 Steps of Data Analysis and the 7 Must Know Facts of Data Analysis in actual quantitative research:

Sample Study 1:

How to Conduct a Data Analysis Study with a Continuous Dependent Variable (using SPSS)