

STUDENT STUDY GUIDE WITH SPSS WORKBOOK FOR

# STATISTICS

for the

# BEHAVIORAL SCIENCES

SECOND EDITION

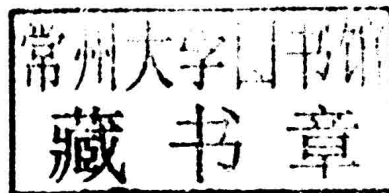


 Gregory J. Privitera



# Student Study Guide With SPSS Workbook for *Statistics for the Behavioral Sciences*

2nd Edition



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# How to Use This Study Guide

**T**his study guide will help prepare you for exams and course materials. It can be used to help you prepare for exams and to test learning outcomes for the SPSS learning objectives. You will find many features for each chapter that meet these aims. As an overview, the contents of each chapter are as follows:

- Chapter learning objectives
- Chapter outline
- Chapter formulas
- Tips and cautions for students
- Key term word searches and crossword puzzles
- Practice quizzes organized by learning objective
- SPSS in Focus exercises
- Chapter summaries by learning objective

In addition, the answers to all word searches, crossword puzzles, and practice test questions are provided in the back matter of this study guide. Also, a General Instructions Guidebook (GIG) for using SPSS is provided in the Appendix. The GIG provides general instructions for using IBM SPSS<sup>1</sup> statistical software for each of the SPSS in Focus sections in the book. To give you a sense of how the contents in this study guide can help you study and test your knowledge, let's briefly look at what is included for each chapter.

## Chapter Learning Objectives

The chapter learning objectives are listed on the chapter title page for each chapter in the book and are listed in this study guide as well. Learning objectives allow you to split the chapter topics into manageable units. Studying one learning objective at a time is far more manageable and

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<sup>1</sup>IBM SPSS® Statistics was formerly called PASW® Statistics.

possibly less overwhelming than studying the entire chapter content at one time. In addition, the learning objectives allow professors to assign readings that are specific to the content in each chapter that they find most important or will test most heavily. The learning objectives are important inasmuch as they provide the backbone of each chapter. The learning objectives are used to organize the material covered in each chapter and organize how you can study the content in each chapter. Indeed, notice that the chapter test questions and the chapter summaries in this study guide are organized by learning objective.

## Chapter Outline

An outline with a review of material covered and key terms is included with each chapter. Many students find it easier to organize their notes using an outline. Reviewing this outline can give you a good sense of where in the chapters you need to study more and where you are mastering the material. Each chapter outline lists the main headings in each chapter and gives a brief description of the material covered. The outline is a good resource for reviewing chapter material and studying for exams.

## Chapter Formulas

The formulas, if any, are listed for each chapter. The formulas for each chapter are also listed in the learning objective summaries at the end of each chapter in the book. Often you will need to refer to formulas to complete assignments, compute statistics, and study for exams. The list of formulas in this study guide allows you to quickly find the formulas you need to complete your assignments or to study for exams.

## Tips and Cautions for Students

The Tips and Cautions for Students sections in this study guide are aimed to bring your attention to topics in each chapter that tend to be the most difficult for students. In addition, tips are provided to help you master the difficult material. If you are having difficulty mastering material in a chapter, then refer to this section. It is likely that you are not alone and that this section will have useful tips to help you master the material.

## Key Term Word Searches and Crossword Puzzles

It is important to review key terms and definitions in each chapter. In each chapter, key terms are bolded and defined. All bolded terms are then listed in the end material of each chapter. In this

study guide, most key terms are included in word searches and crossword puzzles. Reviewing definitions can be boring. The crossword puzzles and word searches can make this review a little more fun and interesting. It's also a nice break from standard multiple-choice and fill-in-the-blank question formats.

## Practice Quizzes Organized by Learning Objective

It is always important to study prior to an exam. It can often be just as effective—sometimes more effective—to work through practice quizzes prior to taking an exam. Quiz questions can show you where you might be misunderstanding certain material and where you are mastering the material. Three to five quiz questions are given for each learning objective in this study guide—almost 500 quiz questions in all. Completing the quiz questions will help you check your mastery of each learning objective. Because the quiz questions are given for each learning objective, you will also know immediately which sections of the chapter you are struggling with the most and which sections you are mastering. The answers to all quiz questions are given in the back of this study guide so that you can check your answers.

## SPSS in Focus Exercises

SPSS in Focus sections are included in each chapter of the book to introduce you to the statistical software used by most behavioral researchers. The steps to enter, analyze, and interpret data using SPSS are described using practical research examples. This student study guide supports each SPSS in Focus section by including SPSS exercises for each chapter. The SPSS exercises in this study guide allow you to practice using SPSS and interpret output data using new research examples. A General Instructions Guidebook (GIG), provided in the back matter, provides general instructions that can be used for any example. An answer key for the SPSS exercises is not included to allow professors or instructors to use these exercises as a way of assessing your mastery of the SPSS learning objectives.

## Chapter Summaries by Learning Objective

Chapter summaries are given at the end of each chapter in the book and in this study guide. The chapter summaries are organized by learning objective. This can help you quickly review learning objective material as you take the chapter quizzes. When you get a few questions wrong for a learning objective, you can then quickly refer to the chapter summary for that learning objective. Including the chapter summaries by learning objective in this study guide allows you to efficiently study chapter material.

Keep in mind that this study guide is designed to help you study and to learn the material covered in each chapter of *Statistics for the Behavioral Sciences*, 2nd edition. This student study

guide supports the content in each chapter of the book by testing your retention and mastery of chapter material and allowing you to quickly review content that you are struggling with the most. The study guide provides quick references to formulas, key terms, and learning objectives in each chapter and includes assessments for the SPSS learning objectives. You will find many of the features in this study guide very useful for studying chapter content and preparing for exams. In all, this study guide was written to indubitably help you master chapter content in *Statistics for the Behavioral Sciences*, 2nd edition, and to achieve your personal goals of success in the classroom.

Student Study Guide  
With SPSS Workbook for  
*Statistics for the  
Behavioral Sciences*

2nd Edition



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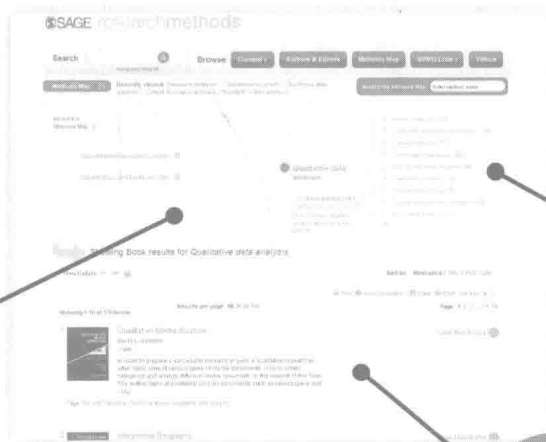
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## PART I

# **Introduction and Descriptive Statistics**

# 1

## Introduction to Statistics

### LEARNING OBJECTIVES

After reading this chapter, you should be able to:

1. Distinguish between descriptive and inferential statistics.
  2. Explain how samples and populations, as well as a sample statistic and population parameter, differ.
  3. Describe three research methods commonly used in behavioral science.
  4. State the four scales of measurement and provide an example for each.
  5. Distinguish between variables that are qualitative or quantitative.
  6. Distinguish between variables that are discrete or continuous.
  7. Enter data into SPSS by placing each group in separate columns and each group in a single column (coding is required).
-

## CHAPTER OUTLINE

### 1.1 The Use of Statistics in Science

*Statistics:* A branch of mathematics used to summarize, analyze, and interpret a group of numbers or observations. The information that scientists gather is evaluated in two ways that reveal the two general types of statistics:

- Scientists organize and summarize information such that the information is meaningful to those who read about the observations scientists made in a study. This type of evaluation of information is called *descriptive statistics*.
- Scientists use information to answer a question (e.g., Is diet related to obesity?) or make an actionable decision (e.g., Should we implement a public policy change that can reduce obesity rates?). This type of evaluation of information is called *inferential statistics*.

### 1.2 Descriptive and Inferential Statistics

*Descriptive statistics:* Procedures used to summarize, organize, and make sense of a set of scores or observations. Descriptive statistics are typically presented graphically, in tabular form (in tables), or as summary statistics (single values).

*Data*, or numeric measurements, are the values summarized using descriptive statistics. Presenting data in summary can clarify research findings for small and large data sets.

*Inferential statistics:* Procedures used to infer or generalize observations made with samples to the larger population from which they were selected. Scientists rarely have the resources or ability to select all individuals in a *population* (all members of a group of interest). Instead, scientists select a *sample* (or subset) of those from the larger population, then use inferential statistics to identify the extent to which observations made in the sample would also be observed in the larger population from which the sample was selected.

### 1.3 Research Methods and Statistics

*Experimental method:* An experiment is any study that controls the conditions under which observations are made to isolate cause-and-effect relationships between two variables. To conduct an experiment, we must meet three requirements: *randomization*, *manipulation*, and *comparison*.

- *Randomization* consists of using random assignment to ensure that all participants in the study have an equal probability of being assigned to a group.

- *Manipulation* consists of creating the levels of the independent variable. Each level is a group—hence, manipulation allows us to create groups to which the participants will be randomly assigned.
- *Comparison/control* involves the use of a comparison or control group that does not receive the manipulation believed to cause changes in a dependent variable. Comparing the control group to a group that received the manipulation allows us to determine if the manipulation is actually associated with changes in the dependent variable.

*Independent variable (IV):* The variable that is manipulated in an experiment. By manipulating the IV, we create the different groups in a study.

*Dependent variable (DV):* The variable that is measured in each group or at each level of the independent variable. The dependent variable must be *operationally defined*, meaning that it is defined by the specific process or manner by which it was observed or measured.

*Quasi-experimental method:* A quasi-experiment is a research design that includes a quasi-independent variable and/or lacks a comparison or control group.

- A quasi-independent variable is any variable with preexisting levels. For example, if we group participants by gender (men, women), then the variable is a quasi-independent variable—the participants were men or women before the study began; hence, the researcher did not manipulate or create the gender groups in the study.

*Correlational method:* The measurement of pairs of scores, called data points, examines the extent to which two variables are related. No variable is manipulated to create different groups to which participants can be randomly assigned. Instead, two variables are measured for each participant, and the extent to which those variables are related is measured. Hence, correlations lack the control needed to demonstrate cause and effect.

## 1.4 Scales of Measurement

*Scales of measurement* are the rules that describe how a number was measured and the extent to which it is informative. Four scales of measurement are *nominal*, *ordinal*, *interval*, and *ratio*.

*Nominal scales:* Measurements where a value is used to represent something or someone.

- Nominal values are typically coded, or converted to numeric values for later statistical analysis.

*Ordinal scales:* Measurements where values convey order or rank alone. Ordinal scale data simply indicate that one value is greater than or less than another value.

*Interval scales:* Measurements with two defining principles—equidistant scales and no true zero.

- *Equidistant scales* are intervals with values that are distributed in equal units.
- A *true zero* is a scale where 0 indicates the absence of something. An interval scale lacks a true zero. Examples of scales without a true zero include rating scales, temperature, and measures of latitude and longitude.

*Ratio scales:* Measurements with two defining principles—equidistant scales and a true zero.

- Examples of scales with a true zero include weight, height, time, and calories.

## 1.5 Types of Variables for Which Data Are Measured

*Continuous variables* are measured along a continuum, such that they can be measured at any point beyond the decimal point. Continuous variables can be measured in whole or fractional units.

*Discrete variables* are measured in categories or whole units and are *not* measured along a continuum. Discrete data are not measured in fractional units.

*Quantitative variables* vary by amount, can be continuous or discrete, and are measured in numeric units.

*Qualitative variables* vary by class, can only be discrete, and are used to describe nonnumeric aspects of phenomena.

## 1.6 Research in Focus: Evaluating Data and Scales of Measurement

When a research study includes a qualitative variable, researchers will often also include quantitative variables because these can be more informative. For example, in their study on social networking, Jones, Blackey, Fitzgibbon, and Chew (2010) interviewed college students and recorded their qualitative responses. In addition, they measured quantitative variables by having students rate how often they used certain social software technologies. Because quantitative variables are more widely measured in the behavioral sciences, this book describes statistical procedures for quantitative variables on each scale of measurement.

## 1.7 SPSS in Focus: Entering and Defining Variables

SPSS can be used to enter and define variables. All variables are defined in the Variable View tab. The values recorded for each variable are listed in the Data View tab. Data can be entered by column or by row in the Data View tab.



## TIPS AND CAUTIONS FOR STUDENTS

- *Dependent and independent variables:* To identify the independent variable (IV) and dependent variable (DV) in an experiment, start by determining the hypothesis that is being tested in the experiment. Then ask, what is being measured in each group to test this hypothesis? The dependent variable is typically measured in numeric units. To determine the independent variable, refer back to the groups. Determine what the researcher thinks is causing or is associated with changes in the DV. The different groups are the levels of the independent variable.

Note that a quasi-independent variable is a variable that is preexisting. This type of variable is used in a quasi-experimental or a correlational research design. Unlike an experiment, the levels of a quasi-independent variable are preexisting, meaning that the researcher did not manipulate the levels of that variable.

- *Scales of measurement:* When determining the scale of measurement a variable is measured on, first assess whether the variable is categorical. If it is categorical, then it is likely on a nominal scale. If it is a ranked value or one that indicates only that one value is larger than another, then it is likely on an ordinal scale. Interval scale measures are typically rating scales, where participants indicate their level of agreement or opinion regarding items in a survey. To distinguish an interval scale from a ratio scale, assess whether the scale has a true zero. If 0 indicates the absence of the variable you are measuring, then it has a true zero and is on a ratio scale; if not, then it does not have a true zero and is on an interval scale.