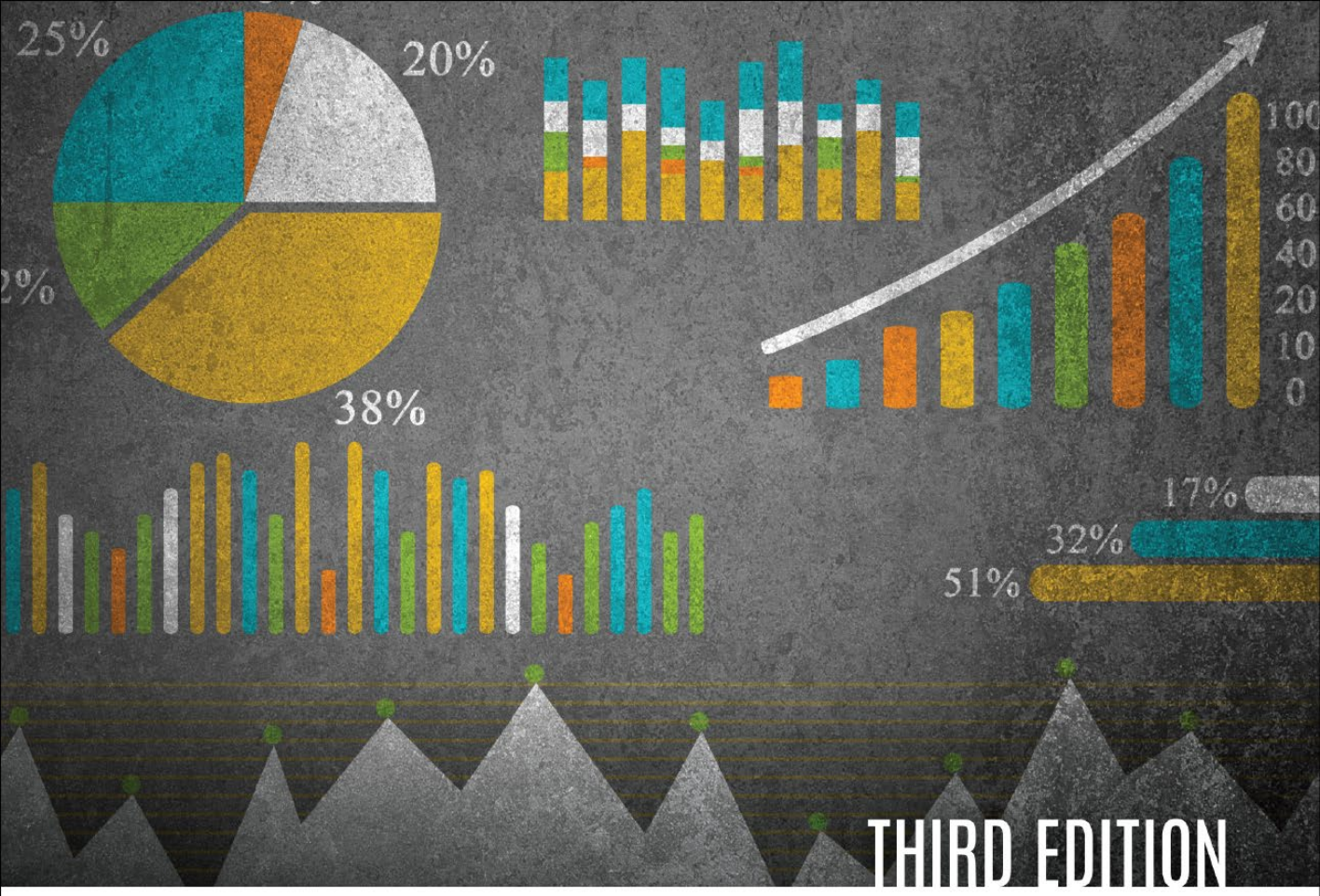


USING IBM® SPSS® STATISTICS

An Interactive Hands-On Approach

JAMES O. ALDRICH

USING IBM® SPSS® STATISTICS

Third Edition

I dedicate this textbook to my three children, Sally, James (1965–1996), and Wendy. The encouragement and support for their father in his educational pursuits was (and is) far above the call to duty.

—James O. Aldrich

Sara Miller McCune founded SAGE Publishing in 1965 to support the dissemination of usable knowledge and educate a global community. SAGE publishes more than 1000 journals and over 800 new books each year, spanning a wide range of subject areas. Our growing selection of library products includes archives, data, case studies and video. SAGE remains majority owned by our founder and after her lifetime will become owned by a charitable trust that secures the company's continued independence.

Los Angeles | London | New Delhi | Singapore | Washington DC | Melbourne

USING IBM® SPSS® STATISTICS

An Interactive Hands-On Approach

Third Edition

James O. Aldrich
California State University,
Northridge

SAGE

Los Angeles | London | New Delhi
Singapore | Washington DC | Melbourne

FOR INFORMATION:

SAGE Publications, Inc.
2455 Teller Road
Thousand Oaks, California 91320
E-mail: order@sagepub.com

SAGE Publications Ltd.
1 Oliver's Yard
55 City Road
London EC1Y 1SP
United Kingdom

SAGE Publications India Pvt. Ltd.
B 1/I 1 Mohan Cooperative Industrial Area
Mathura Road, New Delhi 110 044
India

SAGE Publications Asia-Pacific Pte. Ltd.
3 Church Street
#10-04 Samsung Hub
Singapore 049483

Copyright © 2019 by SAGE Publications, Inc.

All rights reserved. No part of this book may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without permission in writing from the publisher.

All trademarks depicted within this book, including trademarks appearing as part of a screenshot, figure, or other image are included solely for the purpose of illustration and are the property of their respective holders. The use of the trademarks in no way indicates any relationship with, or endorsement by, the holders of said trademarks. SPSS is a registered trademark of International Business Machines Corporation.

Printed in the United States of America.

ISBN 978-1-5443-1889-9

Acquisitions Editor: Leah Fargotstein
Editorial Assistant: Elizabeth Wells
Production Editor: Andrew Olson
Content Development Editor: Chelsea Neve
Copy Editor: Terri Lee Paulsen
Typesetter: C&M Digitals (P) Ltd.
Proofreader: Barbara Coster
Indexer: Maria Sosnowski
Cover Designer: Glenn Vogel
Marketing Manager: Shari Countryman

This book is printed on acid-free paper.

18 19 20 21 22 10 9 8 7 6 5 4 3 2 1

BRIEF CONTENTS

DETAILED CONTENTS

SECTION IV • RELATIONAL STATISTICS – PREDICTION, DESCRIBING, AND EXPLORING MULTI-VARIABLE RELATIONSHIPS

PREFACE

NEW FEATURES IN THE THIRD EDITION

This third edition was written while using Version 25 and 24 of *IBM SPSS Statistics*.[1] Although 25 is the most recent version available, the information in this book is almost always compatible with the earlier releases. The reader should also note that the student version of the software packages does not have some of the same features. However, the differences in the student version are rarely encountered and will have little effect on learning SPSS and its application to statistical analysis.

At the behest of the users and reviewers, all of the datasets used in this third edition are made available on a new companion website hosted by SAGE (study.sagepub.com/aldrich3e). One of the most useful features in this third edition was the naming and categorization of all datasets used in the book. Such naming made it possible to have these datasets readily available for the professor and student on the companion website. These datasets and the website are discussed in greater detail in the next two sections of this preface.

This third edition has also been reorganized into four sections: I. SPSS Commands and Assignment of Levels of Measurement, II. Descriptive Statistics and Graphing, III. Basic Inferential Statistics, and IV. Relational Statistics—Prediction, Describing, and Exploring Multi-Variable Relationships. The reader is referred to the preceding Detailed Contents for specifics regarding this reorganization.

In response to users and reviewers, a new chapter on inferential statistics was added. This new Chapter 12 is not intended to teach all the "ins and outs" of inferential statistics but to supplement the SPSS software package. Topics such as sampling, statistical significance, and hypothesis testing are addressed to give the SPSS user a foundational understanding of the results of SPSS's statistical procedures. More specific information on the contents of this new chapter can be found in the Detailed Contents. Related to this, there is also a new Appendix B that provides examples of the use of the normal curve and *z*-table to solve probability-type problems. This is intended to make it easier for the IBM SPSS Statistics software user to visualize the significance level and rejection area of the mathematical normal curve. This new appendix is an effort to encourage the student/statistician to examine and understand the real meaning and importance of the *Sig. (2-tailed)* column shown in much of SPSS's output.

[1]IBM and SPSS are registered trademarks of International Business Machines Corporation.

The Review Exercises section of each chapter now has five problems. As in the second edition, the first three exercises have their solutions provided in Appendix C. The expanded number of problems (numbers 4 and 5) provide a wider range of applications for the particular statistical procedure. The answers to these two additional problems are only made available for the professor through the companion website (study.sagepub.com/aldrich3e) so that they may serve as lab work, homework, and/or test questions.

As in the first and second editions, this third edition can be used in conjunction with an instructor or as a self-instructional guide. It retains the well-received bulleted points, which inform the SPSS user, in exacting terms, what has to be done to accomplish certain statistical operations. The numerous screenshots are complemented with a generous supply of callouts that are used to direct the reader's attention to specific control points. It is thought that as the student progresses through the chapters, many of the detailed bullet points will become unnecessary. One reason for the detailed instructions was to make it possible to pick up the book and turn to any statistical procedure (e.g., Logistic Regression) and conduct the analysis with little prior knowledge of the IBM SPSS Statistics software package. In this capacity, the book performs well as a "how to" manual.

WEBSITE ADDED TO THE THIRD EDITION

A website hosted by SAGE has been added to the third edition. This website features two major sections, one for the professor and another for the student.

Both student and instructor-facing sites include **step-by-step SPSS tutorial videos** created by the author that provide screencast demonstrations of major concepts from each chapter. Videos can be shown in class or watched at home for study and practice.

Visit study.sagepub.com/aldrich3e

Professor-Facing Website Section

The professor-facing section provides direct access to *all* datasets used in the book. Some of these datasets are only made available for the professor and not the student. This is because this book considers data structuring and entering as an important part in learning how to use the SPSS Statistics software package. The book goes into great detail on how to structure and then enter data for analysis. The restricted access to selected datasets allows the professor to decide which datasets should be made available to the student. Given this restricted access, the professor is able to decide how much time the student spends structuring and entering data. All datasets are described in the next section of this preface.

The professor-facing side of the website also provides the answers, with explanations, for exercises 4 and 5 found at the end of each chapter. These two exercises and answers make excellent source material to test student chapter competence. These two additional problems could also be assigned as lab or homework material. This section also contains a mix of 10 true/false and multiple-choice quiz-type questions. Also included for each of these 10 questions are answers, cognitive domain according to Bloom's taxonomy, answer location, and difficulty level.

Student-Facing Website Section

The student-facing section contains many of the datasets, but not all. As mentioned above, selected datasets appear only on the professor-facing section of the website. These hidden datasets are intended to provide the student with the challenge of directly structuring and entering data. An example of such a dataset can be found in Appendix A. The major portion of Chapter 5 is devoted to step-by-step instructions on how to structure and enter the data found in Appendix A. Other datasets are found throughout the book and are intended to add to the student's data entry learning experience. The student-facing section also contains 10 true/false and multiple-choice practice quiz questions with answers.

DATASETS USED IN THE THIRD EDITION

All datasets used in this book, except the SPSS sample files, are presented in the text in table format. These data tables are provided for those users not having direct access to the companion website. There is also a complete list of all datasets, by chapter, used in this third edition that can be found in Appendix D.

As in any book concerned with data analysis, many datasets and a large amount of data are required. There are three main categories of datasets used in the third edition: (1) SPSS sample files, (2) datasets used as chapter examples, and (3) datasets used in Review Exercises.

SPSS Sample Files. Notice that many datasets from the SPSS sample files are used throughout the book. These datasets are the result of data manufactured, by SPSS, for instructional purposes. These datasets were installed as part of the SPSS software package. Instructions on how to open these important files are given in Section 3.6. These IBM datasets can also be directly downloaded from the companion website. These SPSS sample files are used in the chapters as examples and also in many of the Review Exercises. These require that you download them and then follow bullet points to perform the analysis. Datasets with only a name and ".sav" are identified as SPSS's sample files.

Datasets Used as Chapter Examples. The data used in chapters explaining statistical procedures can be SPSS sample files or datasets created by the student. Many of the earlier chapters give very specific instructions on how to input the variable and data information that is provided in tables. Doing this is intended to teach the student how to structure variables and data in a manner "understood" by the SPSS software. The datasets used in chapter examples are available on the companion website (study.sagepub.com/aldrich3e), some with access for the professor only. This is done to give the professor the option of making them directly available to the student—as some are lengthy and can be time-consuming to enter. The naming of these example datasets follows the same general pattern of hospital_expl_chap12.sav. Note the "expl" and "chap12" in the naming of these datasets. Datasets with "expl" in their name are used in chapter examples.

Datasets Used in Review Exercises. The datasets used in the Review Exercises at the end of each chapter are also a combination of SPSS sample files and student-entered data. Many of these can be downloaded directly from the companion website by the student. These

student-created datasets have the following naming convention: prob_24.3_church_attend.sav. Note that these datasets always begin with "prob"; datasets beginning with "prob" are used in the Review Exercises.

In some cases, actual data were used, such as the dataset listed in Appendix A, and Tables A.1 and A.2, called *class survey1.sav*. However, in most instances, especially in the Review Exercises, the data were manufactured for the purpose of demonstrating a particular statistical technique. The results of the demonstrated analysis should be considered as a demonstration of a statistical process—*not* as research facts. We encourage readers to use their own data to duplicate some of the techniques illustrated in this book.

BOOK'S UNIQUENESS

A novel approach taken in this book is the inclusion of parametric and nonparametric statistical tests in the same chapters. Other books describe parametric and nonparametric tests in separate chapters, which tends to add unnecessary confusion. Placing of the nonparametric and parametric tests together in the same chapter is convenient to learning how and when to use these tests.

The book is unique in that it encourages the reader to interact with IBM SPSS on the computer as he or she works through the examples and Review Exercises in each chapter. Every effort has been made to ensure that the book is "user-friendly" as the reader is guided through the interactive learning process. Bulleted phrases provide straightforward step-by-step instructions that are followed by the reader to successfully complete the statistical procedures.

This third edition of *Using IBM® SPSS® Statistics: An Interactive Hands-On Approach* continues to be a useful resource for readers who have some background in statistics. However, it will also provide a wealth of basic information to those individuals who know little or nothing about statistics. What this means is that this book is for those who want SPSS to do the actual statistical and analytical work for them. They want to know how to organize and code the data and then enter it into SPSS in a way that allows SPSS to make sense of them. Once this is accomplished, they want to know how to ask SPSS to analyze the data and produce a report with tables and charts in a manner understood by the user. In short, they want the IBM SPSS Statistics software package to accomplish the tedious work needed to successfully accomplish statistical analysis!

CHAPTER AND APPENDIX CONTENT

All chapters include bullet points, screenshots, and callouts showing the reader exactly how and where to enter SPSS commands. Chapters and appendices are briefly described next.

Section I. SPSS Commands and Assignment of Levels of Measurement. The material covered in Chapters 1 through 8 provide basic but essential information regarding navigating in SPSS, getting data in and out of SPSS, and determining the appropriate level of measurement required for a specific statistical procedure. Chapters 5 and 6

describe additional methods for entering data, entering variable information, computing new variables, recoding variables, and data transformation. In Chapter 5, you will enter variable descriptions and raw data from an important dataset (*class_survey_1_expl.sav*) found in Appendix A. This dataset will be used in many of the subsequent chapters. Chapter 7 provides directions for printing files, the output from statistical analysis, and graphs. Chapter 8 describes and explains the Help Menu available in SPSS and how to find information on various statistical tests and procedures.

Section II. Descriptive Statistics and Graphing. Chapter 9 describes and explains basic descriptive statistics. Chapters 10 and 11 provide hands-on experience in creating and editing professional-quality graphs for data at all levels of measurement.

Section III. Basic Inferential Statistics. Chapters 12 through 21 provide hands-on experience in employing the various statistical procedures and tests available in SPSS, including both parametric and nonparametric tests.

Section IV. Relational Statistics—Prediction, Describing, and Exploring Multi-Variable Relationships. In this section, you will find chapters on correlation, regression, and factor analysis.

Appendices. Appendix A contains an essential dataset that is entered by the student in Chapter 5. It is named and saved—as *class_survey_1_expl.sav*—and then used throughout the book. This dataset is then modified—saved as *class_survey_2_expl.sav*—and also used in other chapters. Appendix B also provides the reader with examples of normal curve probability problems. The appendix includes figures of various normal curves, a *z*-table and three exercises demonstrating the use of the *z*-table and its application to the normal curve. Appendix C gives the answers and detailed explanations for the first three Review Exercises that are provided at the end of each chapter. Appendix D presents a comprehensive list, by chapter, of all datasets used in the third edition.

HOW TO USE THIS BOOK

As the reader will note in the first lesson in Chapter 1, a simple format is used to assist the reader in responding to requests. The reader will be moving the mouse around the computer screen and clicking and dragging items. They will also use the mouse to hover over various items in order to learn what these items do and how to make them respond by clicking on them. Things the reader should click on or select are in **boldface**. Other important terms in the book are in *italics*. Still other items are sometimes enclosed in quotes.

The reader will often be requested to enter information and data while working through the examples and exercises in this book. To help in this procedure, we often present figures that show SPSS windows and then show exactly, using step-by-step bulleted points, where to enter this information or data from the keyboard. And, at times, we use callouts in combination with screenshots to clearly show control points and where to click or unclick specific items.

New to the third edition is the development of a companion website (study.sagepub.com/aldrich3e) that makes it possible for the student to directly download many of the lengthier datasets presented in the Review Exercises. Some of the datasets used in the chapter examples can be downloaded from the book's website but only with the permission of the professor.

IN SUMMARY

The IBM SPSS Statistics program is an outstanding, powerful, and often intuitive statistical package. A primary reason for writing this book was to make the benefits of the SPSS program available, not only to the novice, but also to the more experienced user of statistics. We feel this third edition is appropriate for lower-division and upper-division undergraduate courses in statistics and research methods. As the book expanded over the two prior editions, it has proven to be useful for students at the master's and doctoral levels as well. The book has been shown to be helpful for students and professionals seeking an introduction to the more complex statistical methods and how they are handled by SPSS. Students have also found value in the text when doing the analysis required when writing and researching thesis and dissertation projects.

Look for this icon throughout the text!
SPSS tutorial videos on key topics from the book are available online at study.sagepub.com/aldrich3e

ACKNOWLEDGMENTS

I first thank my students, who for many years followed my often hastily written instructions on how to get SPSS to do what it was supposed to do. Continued thanks and appreciation go to James Cunningham, who initiated and coauthored the first edition. I also thank Hilda M. Rodriguez for her careful and tireless review of all the SPSS steps and screenshots presented in all three editions of this book.

I wish to thank the professionals at SAGE Publications for their valuable contributions to the publication of this book. They were always there, from the initial drafts, throughout production, and finally to marketing. My first experience with SAGE was excellent, but it has only gotten better over the years while publishing two books and the third edition of this one. I realize more and more that publication requires a team of dedicated individuals, and I am proud to work with such a team envisioned by SAGE's founder, Sara McCune. My first contact with SAGE was with, now retired, Vicki Knight, who saw the merit in the first edition and made this writing project possible. The new acquisitions editor, Leah Fargotstein, moved seamlessly into that position and always had words of encouragement as, together, we structured a much revised third edition. Editorial Assistant for Research and Statistics Elizabeth Wells and Production Editor Andrew Olson always kept me on track during the editing and production process. Content Development Editor Chelsea Neve was always responsive to my many questions and concerns. Thanks also to Barbara Coster for her excellent proofreading. Glenn Vogel produced a perfect cover for the book. Many thanks to Shari Countryman, marketing manager, and Jade Henderson, marketing associate, for their efforts in bringing our work to the attention of potential users. I am especially thankful for the work done during the copy editing process by Terri Lee Paulsen. Terri's attention to detail was very much appreciated and played a major role in the professional appearance of this writing project. I also wish to thank Maria Sosnowski for a superb job on indexing.

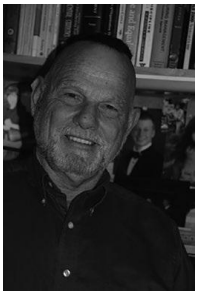
We also thank V. Monica Young (Author's Program) and Amy Bradley (External Submissions) at IBM Chicago for their timely assistance in programming and permissions requirements. Kevin Renn of IBM's External Submissions facilitated permissions allowing the downloading of the SPSS Sample files directly from the book's SAGE website.

I, along with SAGE, would also like to acknowledge the contributions of the following reviewers:

- Dr. Thomas S. Alexander, University of Maryland College Park
- Billy Brocato, Texas A&M University

- Maxwell K. Hsu, University of Wisconsin–Whitewater
- Che-Hui Lien, Thompson Rivers University
- Shlomo Sawilowsky, Wayne State University
- Jennifer Wareham, Wayne State University

ABOUT THE AUTHOR



James O. Aldrich (Doctor of Public Administration, University of La Verne) is a retired lecturer on statistics and research methods at California State University, Northridge. He has also taught graduate-level research courses for the University of La Verne. Dr. Aldrich held the appointment of Instructor in the Department of Pathology at the University of Southern California, School of Medicine, where he served as the principal investigator and codirector of a National Cancer Institute research project. He has served on various committees for the Los Angeles chapter of the American Statistical Association and has also taught biostatistics, epidemiology, social statistics, and research methods courses for 20 years. The primary computer program used for his coursework has been the IBM SPSS Statistics software package. SAGE published, in 2013, *Building SPSS Graphs to Understand Data*, coauthored with Hilda M. Rodriguez.

SECTION I

SPSS COMMANDS AND ASSIGNMENT OF LEVELS OF MEASUREMENT

FIRST ENCOUNTERS

1.1 INTRODUCTION AND OBJECTIVES

Hi, and welcome to the IBM SPSS Statistics software package. The value in learning how to utilize the power of the SPSS program has the potential to have a tremendous impact on one's life. This impact can be especially evident when one is searching for the *truth*, which is often hidden within a mass of data. One way to discover truth is to utilize the scientific method and mathematical calculations; both of these are made more easily accessible by using SPSS.

Science, when reduced to its simplest definition, can be said to be the *measurement and analysis of observations made by humans*. Taking this into account, one of the reasons for writing this book was to provide readers with the knowledge to use the *power* of the IBM SPSS Statistics software package to measure and analyze data from their own research/observations. This first chapter begins with a demonstration of the entry and analysis of data. It is the ability to analyze one's own data, see them come to life, that makes data analysis an exciting adventure into the unknown. Many (or most) of the SPSS instructional textbooks only utilize existing datasets and provide minimal, if any, guidance on how to structure and enter data. Therefore this first chapter, and the entire book, continues with the philosophy that it is wise to know how to enter personal data into the IBM SPSS software package. On leaving the academy and finding work in the real world, the ability to analyze data using SPSS can prove extremely useful in advancing one's career. This third edition continues to provide the reader with many opportunities for actually entering data, not just opening existing datasets. Readers are encouraged to enter their own personal data as this makes the discovery process that much more exciting. There are few things in research that are more rewarding than making that final click on the mouse and watching your mass of numbers come to life with new meaning and purpose. Whether it's a graph, a prediction equation, or perhaps a test showing a statistically significant difference between groups, the discovery of the unknown that was hidden within the data can be extremely gratifying. The rewards of data analysis can give, and often have given, new meaning to the lives of researchers and to entire societies that benefit from discovery. The major purpose of this book is to assist the student/statistician in exactly that—making discoveries with the

assistance of the IBM SPSS Statistics software. This first chapter begins a journey leading to an understanding of how to use SPSS in making such discoveries in an effort to find statistical evidence supportive of *truth*.

With that being said, it is assumed that you know little about variables, values, constants, statistics, and those other tedious things. But it is assumed that you know how to use a mouse to move around the computer screen and how to click an item, select an item, or drag (move) an item.

An easy mouse-using and -typing convention has been adopted for you to respond to requests. For example, if you are requested to open an existing file from the SPSS *Menu*, you will see click **File**, select **Open**, and then click **Data**. In general, you will be asked to click an item, select (position the pointer over) an item, drag an item, or enter data from the keyboard. Note that in SPSS, the columns in the spreadsheets run vertically and the rows run horizontally, as in a typical spreadsheet such as Excel.

OBJECTIVES

After completing this chapter, you will be able to

- Enter variables into the Variable View screen
- Enter data into the Data View screen
- Generate a table of statistics
- Generate a graph summarizing your statistics
- Save your data
- Open Output Viewer
- Save the analysis (output)

1.2 ENTERING, ANALYZING, AND GRAPHING DATA

Watch the tutorial video at study.sagepub.com/aldrich3e

In this section you are walked through your first encounter with SPSS and shown how to enter some data, analyze those data, and generate a graph. Once these steps are completed you will have a better understanding of the data by viewing the table and graph.

If you see the IBM SPSS icon anywhere on the screen, simply click it; otherwise, locate your computer's program files, and open SPSS from there. Once the SPSS starts, a screen will appear, which can take different forms depending on the SPSS version you are using. There are some useful shortcuts in these SPSS opening windows, but for

now simply close the window. When the window closes, you will see the Data Editor spreadsheet on the screen. This screen can appear in two different ways depending on which tab is clicked at the bottom of the Data Editor screen. These two tabs, Data View and Variable View, are together called the SPSS Data Editor. When you wish to enter or view variable information, you click the Variable View tab, and when you wish to enter or view data, you simply click the Data View tab. Figures 1.1 through 1.4 provide pictures of various portions of these two screens.

Let's get started with a demonstration of the bullet point part of this introduction to SPSS. Within the text of various bullet points you will often find parentheses containing figure numbers. These referenced figures will assist the SPSS user when following the step-by-step instructions.

- Start SPSS, close the opening window as discussed above.
- At the bottom of the Data Editor spreadsheet screen, there are two tabs; click **Variable View** (see Figures 1.1 and 1.2).

FIGURE 1.1 ⬢ UPPER-LEFT PORTION OF THE VARIABLE VIEW SCREEN OF THE SPSS DATA EDITOR

FIGURE 1.2 ⬢ LOWER PORTION OF THE VARIABLE VIEW SCREEN OF THE SPSS DATA EDITOR

- At the top of the screen, type the word *Eagles* in the cell (this is the cell below *Name* and to the right of Row 1). The callout (balloon) shown in Figure 1.3 points to the cell in which you are to enter the variable name "Eagles." Cells are the little boxes at the intersection of *columns* and *rows*.

- Click the **cell** below *Measure*, and select *Nominal* (see Figure 1.1).

FIGURE 1.3 ⬢ SMALL PORTION OF THE VARIABLE VIEW SCREEN

- At the bottom of the screen, click **Data View** (note that the screen's appearance changes slightly).
- You will now enter the number of eagles observed on five consecutive days at the top of Holcomb Mountain. The callout in Figure 1.4 shows exactly where to type the number *3* (Row 1 and Column 1); for now, don't worry about the decimal points (this will be addressed in the next chapter).

FIGURE 1.4 ⬢ SMALL PORTION OF THE DATA VIEW SCREEN

- Click in Row **2**, and type *4*; click in Row **3**, and type *2*; click in Row **4**, and type *1*; and finally click in Row **5**, and type *6*. Your screen should now look as shown in Figure 1.4. If you make a mistake in entering the numbers, just click the cell and reenter the correct number.
- After you have entered the five pieces of data, check carefully to see if the entries are correct. If they are, save your work as follows: Click **File**, and then click **Save As**.
- A window titled *Save Data As* will open, in which you will enter a name for your work (throughout this book, work like this is referred to as a project). For this project, enter the name *eagles_expl.sav* in the *File Name* box (you will use this saved dataset later). The *Look in* box (located in the middle of the window), showing where the file will be saved, should have an entry titled *Documents* (if not, then click the **black arrow** and scroll until you see *Documents*). Click **Save**. Your data have now been saved in the *Documents* section of your computer.
- An *Output* window may open; if so, close it by clicking the **white "x" in the red box**. Another dialog box may open asking if you wish to save the output; click **No**.
- Let's continue with the exercise. On the SPSS *Menu* at the top of the screen, click **Analyze**, select **Descriptive Statistics**, and then click **Frequencies**. A window will appear titled *Frequencies*. Drag **Eagles** to the *Variable(s)* panel, or click **Eagles** and then click the **right arrow** to place *Eagles* in the *Variable(s)* panel (both methods work equally well).
- Click the **Statistics** button (the *Frequencies: Statistics* window opens). In the *Central Tendency* panel, click **Median** and **Sum**, then click **Continue**.
- Click **OK** (another screen opens, titled *Output IBM SPSS Statistics Viewer*, which shows the results of the analysis just requested). Look at Figure 1.5 for these results.

FIGURE 1.5 ⬢ FREQUENCY STATISTICS FOR 5-DAY EAGLE OBSERVATION

Frequencies

Days of observation

Statistics

Eagles

N	Valid	5
	Missing	0
Median		3.0000
Sum		16.00

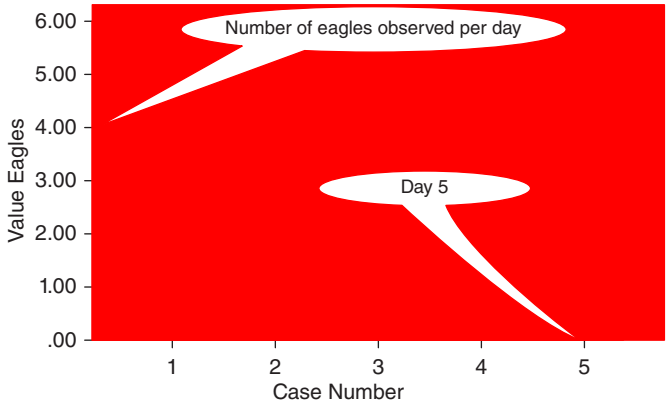
- On the Main Menu, click **Graphs**, select **Legacy Dialogs**, and then click **Bar**.
- The *Bar Charts* window opens; click **Simple**, and then click **Values of Individual Cases**. Click **Define**.
- The *Define Simple Bar: Values of Individual Cases* window opens. Click **Eagles** and drag it to the *Bars Represent* box, or click the **right arrow** to place *Eagles* in that box. Click **OK**. A simple bar graph will appear in the same *Output IBM SPSS Statistics Viewer* screen below the table, as shown in Figure 1.6.

After you have reviewed the graph, you will save the *Output IBM SPSS Statistics Viewer* screen, which contains the results of your analysis and the graph. In the future this screen will simply be referred to as the *Output Viewer*.

- In the *Output Viewer* screen, click **File**, and then click **Save As**.
- A window titled *Save Output As* will appear. In the *File name* box, type *eagles_expl.sav*. Note that the file name is all lowercase and does not include any embedded spaces (blanks). The *Look in* box indicates the location where your file will be saved and should have an entry titled *Documents*. Click **Save**.
- After saving your work, your *Output Viewer* screen will remain. Click the **white "x" in the red box** found in the top right corner to make it go away.

Congratulations! You have just used SPSS (perhaps for the first time) to analyze some data and provide some statistical results and a graph. Looking at the *Frequencies* table shown in Figure 1.5, we see that 16 eagles were observed over a period of 5 days with the median number per day of 3. The bar graph seen in Figure 1.6 provides the details regarding each day's observations. For example, we see that Day 5 yielded the most eagle sightings at 6, while the fewest were observed on Day 4, when only 1 was seen.

FIGURE 1.6 ⬢ BAR GRAPH FOR 5 DAYS OF EAGLE OBSERVATION



Admittedly, the statistical analysis and graph are not that exciting. But they do show you that SPSS is not difficult to use. Of course, you could have used a handheld calculator to do the same analysis in a few minutes. But suppose you had 50 different variables, such as height, weight, eye color, and so on, and thousands of cases for each of the variables! Using a calculator to analyze these data would be a monumental task. But SPSS can do 10,000 cases just as easily as is shown above.

- If you wish to exit (quit using SPSS) at this time, click **File**, and then click **Exit**.

1.3 Summary

In this chapter, you learned how to enter variable names and data. You also learned how to generate a basic table of statistics and a graph summarizing those statistics. In the next chapter, you will learn to navigate in SPSS. You will be introduced to the Main Menu, the Toolbar editor, and the options available for these. Finally, you will be introduced to the various dialog boxes and windows in SPSS that allow you to enter information regarding your variables.

1.4 Review Exercises

Answers for Exercises 1, 2, and 3 can be found in Appendix C while answers for 4 and 5 can be found on the professor-facing portion of the companion website (study.sagepub.com/aldrich3e).

1.1 You have classified the size of several fish that were caught in a "catch and release" fishing contest for children as small, medium, and large. The number of fish caught by the children are 32 small, 21 medium, and 11 large. *Note:* When inputting these data and information, you are *not* required to enter the names for the categories of the fish (small, medium, large). SPSS calls these categories *Labels* and *Label Values*. You will learn to input this information in the next chapter. Input the variable information and data, and build a frequency table and a bar graph. Naming and saving this dataset is optional.

1.2 One day you are sitting in your professor's office getting help on regression analysis. His phone rings; he apologizes but says that he must take the call. As you wait for him to end his phone call, you scan his bookshelves and make mental notes of the titles. You arrive at the following: 15 books on introductory statistical analysis, 12 on advanced statistics, 3 on factor analysis, 8 on various regression topics, 13 on research methods, and 2 on mathematical statistics. You think to yourself, "Wow! This guy must have an exciting life!" As in the previous exercise, don't concern yourself with the category labels for the textbooks. For now, just input the data and variable information, build a bar chart, and generate a descriptive table. Naming and saving this dataset is optional.

1.3 There was a quarter-mile drag race held at the abandoned airport last week. The makes of the winning cars were recorded by an interested fan. The results of her observations were as follows: Chevrolets won 23 races, Fords won 19 times, Toyotas won 3, Hondas won 18, and KIAs won 8 races. As in the previous two exercises, don't concern yourself with the categories' labels for the makes of the cars. Your task is to enter these data and generate a bar graph and a frequency table. Naming and saving this dataset is optional.

1.4 The durability of outside house paint was studied under actual outdoor conditions. Four unique brands—A, B, C, and D—were utilized in the test. A rating scale evaluated each paint's durability over a period of one year. The scale went from 1 to 10, with 10 being the most durable. The results of the test follow: brand A = 6, brand B = 4, brand C = 8, and brand D = 9. You must now enter these data, generate a bar graph (using legacy), and then name and save the dataset. Interpret the graph and decide which brand is most durable and which is the least. Labels are not required at this time—they are covered in the next chapter. Naming and saving this dataset is optional.

1.5 A demographer has collected the following data and must now use SPSS to build a simple bar graph to display her findings. At this time don't be concerned about labels as the *x*-axis will automatically display the ordinal scale as shown in the table—just build the simple bar graph using SPSS. Naming and saving this dataset is optional. The data are given in the following table:

Socioeconomic Class	Income Level	Ordinal Scale	Number of Persons
Lower	0–11,999	1	879
Middle	12,000–99,999	2	3,278
Upper	→100,000	3	250

2

NAVIGATING IN SPSS

2.1 INTRODUCTION AND OBJECTIVES

As with any new software program you may use, it is important that you are able to move around the screen with the mouse. You must also understand the meaning and purpose of the various items that appear on the screen. Consequently, a tour of the Variable View screen, the Data View screen, the Main Menu, and the Data Editor Toolbar are presented in this chapter. You will use all these screens often as you complete the chapters in this book.

OBJECTIVES

After completing this chapter, you will be able to

- Describe the Variable View screen and its purpose
- Describe the Data View screen and its purpose
- Select items from the Main Menu and the Data Editor Toolbar
- Learn to use the 11 items (*Name*, *Type*, *Width*, *Decimals*, *Label*, *Values*, *Missing*, *Columns*, *Align*, *Measure*, and *Role*) found in the Variable View screen to describe your variables

2.2 SPSS VARIABLE VIEW SCREEN

Start SPSS, and click the Variable View tab at the bottom of the screen. Figure 2.1 shows a portion of the Variable View screen.

FIGURE 2.1 ⬢ UPPER PORTION OF THE VARIABLE VIEW SCREEN

As you will recall from Chapter 1, you were briefly introduced to the Variable View screen when you entered the variable "Eagles." This screen shows the *rows* representing variables, and the *columns* representing attributes (properties) and other information that you can enter for each variable. You must provide a name for each variable or SPSS will assign a default name, such as *var1*, *var2*, *var3*, and so on. It is in the Variable View screen that you enter all your variables and their properties. In Section 2.6, you are given all the details needed to properly enter the information on your variables.

Throughout this book, you will often be requested to enter information into a *cell*. Any cell you click is the active cell, displayed in color, indicating that it is ready to receive input from the keyboard. In Figure 2.2, you see an example showing a balloon pointing to the cell in which a variable named "Pre_treatment" has been entered.

2.3 SPSS DATA VIEW SCREEN

Click the Data View tab if you are not already in that screen. A small portion of the Data View screen is shown in Figure 2.3. It is in the Data View screen that you enter data for each variable. Five rows of data for two variables, "Pre_treatment" and "Post_treatment," have been entered as shown in Figure 2.3. The Data View screen is similar to the Variable View

FIGURE 2.2 ⬢ SMALL PORTION OF THE VARIABLE VIEW SCREEN SHOWING TWO NAMED VARIABLES

FIGURE 2.3 ⬢ SMALL PORTION OF THE DATA VIEW SCREEN WITH DATA ENTERED

screen in that it shows rows and columns. However, in Data View, columns represent variables, and rows represent the cases, also called records, associated with each variable. A record may refer to a student, a teacher, a homemaker, an automobile, a tree, or anything that can be measured or counted. Figure 2.3 shows records for five individuals and measurements on two variables called "Pre_treatment" and "Post_treatment."

2.4 SPSS MAIN MENU

Let's take a look at the SPSS Main Menu, referred to hereafter in this chapter as the *Menu*, as shown in Figure 2.4. This *Menu* is displayed at the very top of the Variable View and Data View screens.

FIGURE 2.4 ⬢ MAIN MENU

- Click **File**, and you will see a drop-down list of options you can choose.
- After clicking **File**, slide the mouse cursor over each of the items on the *Menu*—**Edit**, **View**, **Data**, **Transform**, and so on—until you have looked at each item on the *Menu*.

You may have noticed that some of the items on the drop-down menus were dimmed. This indicates that they could not be used at that particular time. There are various reasons for this, such as no open dataset, no statistical test under way, or perhaps no printing operation being done. As you progress through this book, you will see more of these icons undimmed and ready to use.

At this point, don't feel overwhelmed by the amount of information available on the *Menu* as you will only deal with a small portion in your work to become proficient in the use of SPSS. As you advance in using SPSS, you will be introduced to items on the *Menu* on an as-needed basis. Most features in the SPSS program are very intuitive, and after you have finished the first several chapters of this book, you will be breezing through the *Menu*.

2.5 DATA EDITOR TOOLBAR

We next take a look at the Data Editor Toolbar, shown in Figure 2.5, which is a series of icons displayed horizontally across the page directly below the *Menu*. If you do not see this toolbar, do the following: On the *Menu*, click **View**, select **Toolbars**, and then click **Data Editor**.

If there were no data in the Data View screen, some of these icons would be dimmed, as was the case in the drop-down menus attached to the *Menu*. Place the mouse pointer on the first icon on this toolbar, and hover over it. You will see *Open data document*, which is asking if you wish to open a document. Place the mouse pointer on the other icons, and hover over each so that you can see the purpose of these. Much of what you can do using the *Menu* can also be done using the Data Editor Toolbar. The toolbar simply makes your work easier by providing a simpler method. Older versions of SPSS may not include all these icons. But those most frequently used are present in every version of SPSS. The Data Editor Toolbar is displayed in both the Variable View screen and the Data View screen unless you choose to hide this toolbar.

FIGURE 2.5 ⬢ DATA EDITOR TOOLBAR

2.6 VARIABLE VIEW SCREEN: A CLOSER LOOK

Watch the tutorial video at study.sagepub.com/aldrich3e

A portion of the Variable View screen is shown in Figure 2.6.

FIGURE 2.6 ⬢ VARIABLE VIEW SCREEN SHOWING ATTRIBUTE COLUMN HEADINGS

Let's take a closer look at the Variable View screen and examine the options that are available for describing and defining variables, such as the variable "Height." Think of a variable as a container that can hold values. To see how you can enter information regarding variables, do the following:

- Click Variable View.
- Click in Row**1** below *Name*, and type the variable name "Height."
- Click the **cell** below *Type*. If you click in the left part of the cell, you will see a colored square that can be used as a button.
- Click the button, and a window called *Variable Type* will open, as shown in Figure 2.7. (*Note:* Most users feel it is more efficient to simply click the right-side portion of this cell and other similar cells as the dialog window then opens directly—there is no need to click a button).

In the *Variable Type* window, you can select certain settings to tell SPSS what type of numbers or information you wish to enter. In the absence of any additional information, SPSS has chosen *Numeric* or *Unknown* as the type of data about to be entered.

- Click **OK** to close the window.
- Click the **cell** below *Width*. You can use the up–down arrows to set the width of a cell.
- Click the **cell** below *Decimals*. You can use the up–down arrows to change the number of decimal points in the values you are about to enter for that particular variable.
- Click the **cell** below *Label*. You can enter a longer identifying name for a variable. This can be important since this label will appear on much of the output, such as tables and graphs. If you choose not to enter a label, then SPSS reverts to the variable name, which can be sufficient in some cases.
- Click the right side of the **cell** below *Values*, and a window will open, as shown in Figure 2.8.

You can use this window to enter *labels* and *value labels* for variables (these items were referenced in the Review Exercises of Chapter 1). In the example shown in Figure 2.8, you see a *Value* of *1* and a *Label* of *tall*. This simply indicates that all people described as possessing the attribute of *tallness* will be entered under the variable "Height" as the number 1. The *Value Labels* window is described and explained in more detail in Chapter 5 when you enter a complete dataset.

- Click **Cancel** to close the window.
- Click the **cell** below *Missing*, and you will see a window, shown in Figure 2.9, in which you can enter information on missing values associated with the variables.

FIGURE 2.7 *VARIABLE TYPE* WINDOW

FIGURE 2.8 *VALUE LABELS* WINDOW

- Click **Cancel** to close the window.
- Click the **cell** under *Columns*. You can use the up–down arrows to set the width of a column.
- Click the **cell** below *Align*. You can use the arrow to align information in a column.

FIGURE 2.9 *MISSING VALUES* WINDOW

- Click the **cell** below *Measure*, which reads *Unknown*. You can use the arrow to indicate whether the level of measurement for a particular variable is *Scale*, *Ordinal*, or *Nominal*. We will have much to say about these three choices in Chapter 4 when levels of measurement are discussed.
- Click the **cell** below *Role*, which reads *Input*. A drop-down menu gives you a number of choices. These choices allow you to preselect how a variable is used in the analysis. The default choice for SPSS is *Input*. For the work in this book, we can leave this variable specification as *Input*. In the analytic procedures used, the *Role* of our variables is specified when the particular statistical analysis is selected. If you want additional information on this item, use the *Help Menu*, type in *role*, and select *Overview Variable Role Command*.

2.7 Summary

In this chapter, you have learned to navigate the Variable View and Data View screens. You were introduced to various dialog windows and boxes used to enter information regarding variables, including *Name*, *Type*, *Width*, *Decimals*, *Label*, *Values*, *Missing*, *Columns*, *Align*, *Measure*, and *Role*. You investigated the Main Menu and the Data Editor Toolbar and the options available for each of these. In the next chapter, you will learn how to save your data and output and how to get data and information in and out of SPSS.

2.8 Review Exercises

Answers for Exercises 1, 2, and 3 can be found in Appendix C while answers for 4 and 5 can be found on the professor-facing portion of the companion website (study.sagepub.com/aldrich3e).

2.1 You have designed a data-collecting instrument that has the following five variables measured at the *scale* level (*labels* are given in parentheses; *decimals* are set to *3* and *align* to *center*): (1) "miles" (speed in miles per hour), (2) "kilometers" (speed in kilometers per hour), (3) "hours," (4) "minutes," and (5) "seconds." Input this information into the Variable View screen, and then enter four cases of fictitious data in the Data View screen.

2.2 You must set up the SPSS *Data Editor* to analyze the three variables listed below on 30,000 individuals. The variables are (1) "age" (label is *age in years*, no decimals, *center-aligned* and *scale* data); (2) "education" (label is *years beyond H.S.*, no decimals, *center-aligned* and *scale* data); and (3) "family" (label is *number of siblings*, no decimals, *center-aligned* and *scale* data). Make up and enter data for three cases—now you only have 29,997 more to enter!

2.3 You are the range safety officer at a long-distance firearms training facility. You have collected the ballistic information on four rifles—data are given below. You would like to set up a data file in SPSS to collect many hundreds of similar cases in the future. The variables are (1) "caliber" (with two decimals, *center-aligned* and *scale* data); (2) "five hundred" (with two decimals, label is *500-yard drop in feet*, *center-aligned* and *scale* data); (3) "one thousand" (with two decimals, label is *1,000-yard drop in feet*, *center-aligned* and *scale* data); and (4) "weight" (having no decimals (label is *bullet weight in grains*, *center-aligned* and *scale* data). Set up the SPSS Variable View page for this range safety officer. There is no need to enter data for this exercise; however, four fictitious cases are shown in the answer in Appendix C.

2.4 You work as a highway patrol officer and your captain has assigned you the task of recording highway speeds on three U.S. highways for a period of 1 hour. You are to record only, and to not intervene except if you observe dangerous driving behavior. The highways to be observed are as follows: U.S. 66, U.S. 138, and U.S. 395. As the person responsible for the patrol unit's data you must complete SPSS's Variable View and then enter data for five cases (make up the highway speeds) for each of the three highways.

2.5 The head librarian at the Campus of Arizona State University at Tempe wishes to research various characteristics of introductory statistics textbooks. He wishes to record the following six variables measured at the scale level: (1) total number of words, (2) number of graphs, (3) number of data tables, (4) number of figures other than graphs or tables, (5) number of chapters, and (6) number of pages in the index. Set up the SPSS Statistics program to accept the data and then enter two rows of fictitious data.

GETTING DATA IN AND OUT OF SPSS

3.1 INTRODUCTION AND OBJECTIVES

It is important that you save your data and output often in case your computer dies or the application you are using quits for no apparent reason. By "often" it is not meant every day or so—every 20 to 30 minutes would be more appropriate. There may be occasions when you need to export your SPSS files to another application. Or you may need to import files from other applications into SPSS. In addition, there are some useful SPSS sample files that were automatically included when SPSS was installed in your computer. You will be requested to use many of these sample files in the Review Exercises presented at the end of each chapter.

OBJECTIVES

After completing this chapter, you will be able to

- Save and open your data and output files
- Open and use sample files
- Import files from other applications into SPSS
- Export files from SPSS to other applications
- Copy and paste data from SPSS to other applications

3.2 TYPING DATA USING THE COMPUTER KEYBOARD

A simple method of entering new data and other information into SPSS is to type them in using the computer keyboard. Whether you are a proficient typist or you use the "hunt and peck" or "peer and poke" method, your information must be entered into cells in the Variable View and Data View screens. It is felt that the importance of typing in data, as opposed to opening existing datasets, has been overlooked in many SPSS textbooks. When opening datasets compiled by others, it is easy to miss the elements of adventure and mystery usually present when analyzing one's own personal data. There is the potential of making a thrilling new discovery by searching for unknown patterns and relationships in the data. In this chapter, you will learn to enter data into the SPSS program. This chapter's examples and exercises will prepare you to directly enter data that you have personally observed and collected.

3.3 SAVING YOUR SPSS DATA FILES

Watch the tutorial video at study.sagepub.com/aldrich3e

It is important that you understand the following convention of SPSS. When you save either a Data View screen or a Variable View screen, both screens are saved together whether you click **Save** or **Save As** on the Main Menu. If it is a new database or if you have made changes to an existing one, then you have the option to just click **Save**. When clicking **Save**, the two screens are saved to the active location and with its current name. When using the **Save As** option, you are able to specify both a new name and a new location. To save the Data View and Variable View screens, do the following:

- Click **File**, select **Open**, click **Data** (*Open Data* window opens); if "Documents" does not show in the *Look in* window, use the arrow to scroll to "Documents" and then locate and click **eagles_expl.sav**, and then click **Open**.
- Click **File** on the Main Menu, and then click **Save As**. A window titled *Save Data As* will open, as shown in Figure 3.1. A folder titled *Documents* will normally appear in the *Look in* box, indicating the SPSS default folder in which *eagles_expl.sav* will be saved. If you wish to save the data in another location, perhaps a flash drive, then you can click on the button next to the *Look in* box (as shown in Figure 3.1), which will give you a drop-down menu of alternative locations. If you wish to change the file name or if you are saving new data that requires a name, you would type the desired name in the *File name* box. Do *not* do this for this particular file.
- Click **Save**. Once you have clicked **Save**, a window will open, as shown in Figure 3.2. Since you have made no changes to the dataset, you may simply click **No**, **Yes**, or the **white "x" in the red box.** Other saving scenarios are self-explanatory.

FIGURE 3.1 ⬢ *SAVE DATA AS* WINDOW

FIGURE 3.2 ⬢ *IBM SPSS STATISTICS 22* WINDOW (*SAVE* OR *REPLACE* WINDOW)

3.4 SAVING YOUR SPSS OUTPUT FILES

If you have requested an analysis or graph related to the data in the Data View screen, that output is displayed on the Output IBM SPSS Statistics Viewer screen. As mentioned in Chapter 1, for brevity this screen is often referred to as the Output Viewer. To demonstrate this process, the *eagles_expl.sav* dataset is once again used to conduct a brief analysis and the Output Viewer screen that contains a statistical table is saved.

- Click **File**, select **Open**, click **Data** (*Open Data* window opens), find and click **eagles_expl.sav**, and then click **Open**.
- Click **Analyze**, select **Descriptive Statistics**, then select and click **Descriptives** (at this point, the *Descriptives* window opens, as shown in Figure 3.3).
- Click the **arrow** in the middle of the *Descriptives* window, which moves the variable "eagles" to the *Variable(s)* panel, then click **OK**. *Output Viewer* window opens
- Click **File**, then click **Save As**.
- A window titled *Save Output As* will appear, and you can indicate the location (folder) where you wish the file to be saved. The folder titled *Documents*, which is the SPSS default folder, normally appears in the *Look in* box. These steps are shown in Figure 3.4. You can also change the default name, in this case *Output1* to something that describes your data. In the *File name* box, type *eagles_expl*.
- Click **Save**. Your output, a statistical table, is now saved with the same name as the data file, making it easier to identify and locate. Note that SPSS automatically assigns an extension of ".spv" to output files, while data files are assigned ".sav"; given this fact, you may assign the same name to both *data* and *output* files without fear of them being overwritten.

3.5 OPENING YOUR SAVED SPSS FILES

Some additional practice on opening your existing SPSS files: You did this in the prior section with fewer specific instructions. To open a data file, from the Main Menu, do the following:

- Click **File**, select **Open**, and then click **Data**. A window titled *Open Data* will appear requesting that you locate the file you wish to open. The word *Documents* will normally appear in this window as the SPSS default folder that contains the file you wish to open.
- Click the **file name** you wish to open.
- Click **Open**. If this is not the location of your file, click the **down arrow** in the *Look in* box and scroll to locate your file.
- Click the **file name**, and it will appear in the *File name* box.
- Click **Open**.

If you are opening an *output* file, click **File**, select **Open**, and click **Output**. Then follow the steps for opening a data file. For example, if you wish to open the data file *eagles_expl.sav*, which you saved when working in the first chapter, do as follows:

- Click **File**, select **Open**, and then click **Data**. The folder titled *Documents* will appear in the *Look in* box.
- Click **eagles_expl.sav**, and then click **Open**.

FIGURE 3.3 ⬢ *DESCRIPTIVES* WINDOW

FIGURE 3.4 ⬢ *SAVE OUTPUT AS* WINDOW

- If you wish to open the *Output* file that you saved, click **File**, select **Open**, and then click **Output**.
- Click **eagles_expl.spv**.
- Click **Open**.

3.6 OPENING SPSS SAMPLE FILES

In this book, a collection of structured data that are to be entered in Data View are referred to as a *dataset*. These *datasets* are shown throughout the book as examples, Review Exercises, and one in Appendix A. When you are in SPSS Data View, simply turn to the appropriate section and enter the data listed on that page. There are also certain exercises that request the entry of data directly from the computer keyboard (more information on these datasets are described in the Preface).

To save you time and toil in entering larger sets of data that may be required to satisfy, for example, assumptions regarding certain statistical tests, you will open SPSS sample data files on your computer. With SPSS installed in your computer, you are given access to many useful SPSS sample files that were included in the installation. These are the SPSS files you will open for analysis.

If you are using SPSS version 25, the below bullet points are unnecessary as these datasets may be directly accessed when first opening SPSS by a single click at the bottom of the *Welcome to IBM SPSS Statistics* page. Simply click **Sample Files** at the bottom of this page and all these important SPSS files are immediately presented. You can then directly open the desired dataset. To open these files in other versions you must follow the below bullet points.

- Start SPSS.
- On the SPSS *Menu*, click **File**, select **Open**, and then click **Data** (the *Open Data* window opens).
- In the *Open Data* window, click the **down arrow** in the *Look in* box; then, scroll up or down to locate your computer's C drive, and click **C drive**.
- A window opens; double click **Program Files**. (If you are unable to find the dataset of interest after completing the following bullet points, try clicking **Program Files x86**).
- A window opens; scroll to and double click **IBM**. (Be sure to double click the file icon.)
- Double click the **file icon** next to *SPSS*.
- Double click the **file icon** next to *Statistics*.
- Double click the **file icon** next to *25* (or whatever SPSS version you are using).
- Double click the **file icon** next to *Samples*.

- Double click the **file icon** next to *English*.
- A window opens in which you will see a long list of files that can now be opened by double clicking the needed dataset or by selecting it and then clicking **Open**.

Note: Opening these SPSS sample files can be tricky, especially on SPSS versions prior to 22. Also, the steps may vary slightly, but the general pattern is the same. Be sure to use the *double click* to proceed throughout the opening process. It is also recommended that you save the most used SPSS sample files in your *Documents* section. This action gives you quicker access to the dataset, as repeated use of the dataset is sometimes required. If you have access to the companion website, these sample files may also be downloaded directly.

The reader is also reminded that there is much more information on this book's datasets in the Preface, and a list of all datasets, by chapter, can be found in Appendix D.

3.7 COPYING AND PASTING DATA TO OTHER APPLICATIONS

A simple method to transfer data from SPSS to other applications such as Excel, and to transfer data from these applications to SPSS, is the familiar copy-and-paste procedure. Next described is the transfer of data from the file *eagles_expl.sav* to Excel:

- Start SPSS.
- Click **File**, select **Open**, click **Data** (*Open Data* window opens)
- In the *Look in* window make sure it reads *Documents* (if not, then scroll to *Documents*).
- Find and then click **eagles_expl.sav**, and then click **Open** (leave this file open).
- Next, open Excel on your computer (a spreadsheet will appear titled *Book 1*).
- Go back to SPSS, click the **Data View** tab and click on the **first cell** below "Eagles," and drag down to select all **five cells** containing the data found in the *Eagles* dataset.
- Right click with your mouse pointer in one of the **highlighted cells**, and click **Copy**.
- Open Excel, right click in the **first cell** below *Column A*, then select and click **Paste**.
- The data from your SPSS file will be transferred to the five cells below *Column A*.
- To copy data from Excel to SPSS, simply reverse the procedure.

3.8 EXPORTING SPSS FILES TO OTHER APPLICATIONS

An easy procedure to export SPSS files for use with other applications such as Excel is to use the *Save As* command from the Main Menu.

- Click **File**, select **Open**, click **Data** (*Open Data* window opens).
- In SPSS sample files, locate, then click on *accidents.sav*, and then click **Open**. (If you need help to locate and open this file, see Section 3.6).
- With the *accidents* file open (the one you wish to export), click **File** and then click **Save As**. A window titled *Save Data As* will open. Choose a destination for the file by clicking the **arrow** in the *Look in* box, which should be displaying the name *Documents*. If this is not the folder you desire, then click the **arrow** and scroll to the correct folder.
- Click the **arrow** in the *Save as type* box, and scroll to the name of the application that will be used to open the file you are saving. There may be different versions of the same application listed. You should choose the version that will most likely be used to open the file. For example, there are several selections for Excel. Not all users of Excel will be able to use the newest version listed, depending on the version of Excel they have installed in their computer. Consequently, it may be wise to choose an earlier version even if that version may lack some of the bells and whistles of the newer version.
- Click **Excel 97 through 2003**, and in the *File name* box type *accidents excel* and then click **Save**. Note that the file extension for Excel is ".xls"; your file has now been saved as an Excel file in SPSS.
- If you start Excel on your computer, you will be able to click **Open** and load this file.

3.9 IMPORTING FILES FROM OTHER APPLICATIONS

Excel is a popular and readily available spreadsheet; therefore, it is used as an example of an application from which you may wish to import data files into SPSS.

- Start SPSS.
- On the Main Menu, click **File**, select **Open**, and then click **Data**. A window titled *Open Data* will appear. In the *Files of type* box, click the arrow to scroll and then select the file type **Excel**. The file you wish to open should be in the *Documents* folder.
- Click **Excel file name**.
- Click **Open**. A window titled *Read Excel File* will appear.
- Click **OK**, and the file will be opened in the SPSS Data View screen.

3.10 Summary

In this chapter, you learned how to save and open your data and output files. You learned how to open the sample files that were installed with SPSS. You also learned how to import files from other applications into SPSS and how to export files from SPSS to other applications. In the next chapter, you will learn how to determine the correct level of measurement for variables. These levels of measurement—*nominal*, *ordinal*, and *scale*—are very important when attempting to analyze data using the IBM SPSS Statistics software.

3.11 Review Exercises

Answers for Exercises 1, 2, and 3 can be found in Appendix C while answers for 4 and 5 can be found on the professor-facing portion of the companion website (study.sagepub.com/aldrich3e).

3.1 With this review exercise, you will open an SPSS sample file *workprog.sav*. Once it is opened, you will save it in your documents file, making it easy to access as you will need this dataset frequently as you progress through this book. Show the first eight variables as they appear in the Variable View.

3.2 In this review exercise, you must import an Excel file from your computer and show the appearance of the *Open Excel Data Source* window and the first six rows of the Variable View screen. There should be an Excel file used as a demonstration for the Excel data program within your system files. Its name is *demo.xls*, and it will be opened as an SPSS spreadsheet; examine the file, and observe that you can analyze the data as in any other SPSS spreadsheet. Show the first six variables as they appear in the Variable View.

3.3 Open another one of SPSS's sample files called *customer_dbase.sav* (it has 132 variables and 5,000 cases), and save it in your documents file. It's another dataset that you will use several times throughout this book. Show the first 6 variables as they appear in the Variable View.

3.4 Locate and then open *bankloan.sav* which is stored in SPSS's sample files (it has 12 variables and 850 cases) and save it in your document file. You will use this dataset several times throughout this book. Show the first five rows of Variable View for this dataset.

3.5 Find and open the sample file named *telco.sav*, which has 42 variables and 1,000 cases. This is another dataset that is used frequently throughout this textbook and would be easier to access if it is saved in your document file. Show the first two rows of the Variable View for this SPSS sample file.

LEVELS OF MEASUREMENT

4.1 INTRODUCTION AND OBJECTIVES

The reader may recall that in the first chapter *science* was defined as "the measurement and analysis of observations made by humans." This chapter, in an introductory way, directly addresses the "measurement" aspect of science.

Thus far, you have progressed through the basic procedures needed to enter variables and data and to navigate in the IBM SPSS Statistics software package. Chapter 4, on *levels of measurement*, covers an essential bit of knowledge required to successfully use SPSS—specifying the correct *level of measurement* for each of your variables. SPSS provides the user with three choices when selecting these levels of measurement: (1) *nominal*, (2) *ordinal*, and (3) *scale*. The major purpose of the chapter is to assist you in selecting the appropriate level of measurement for each of your variables.

Each of the three levels provides the SPSS user with different amounts of analyzable information. Perhaps the most important consideration is that various statistical procedures require that the data be collected and measured at specific levels of measurement. The level of measurement is partially determined by the basic nature of the variable (more on this later); however, the analyst does have a certain degree of freedom when specifying one of the three levels.

Level of measurement is defined as a phrase that describes how measurable information was obtained while observing variables. For example, measuring the length of a banana with a ruler yields *scale* data; ranking individual runners as finishing first, second, and third in a 100-yard dash provides *ordinal* data; and, finally, when the females in a room are simply counted, we have *nominal* data. The information presented in the following sections is concerned with the expansion of this basic definition of *levels of measurement*.

There are many considerations when assigning levels of measurement to variables. There are some hard, empirical rules to follow, but there are also other considerations. Many of these considerations exceed the purpose of this book. Some are mentioned in this chapter, but others are left to the reader to discover as they advance in the use of SPSS for statistical analysis. As an illustration of the challenges faced in assigning levels of measurement, this

chapter includes a section demonstrating SPSS's attempt to assist the user in this important task. However, you will see that **there is *no* substitute for the user's judgment—the SPSS program can only "suggest" levels of measurement**. This is one reason why we have spent so much time and ink on this topic.

OBJECTIVES

After completing this chapter, you will be able to

- Describe the characteristics of *nominal*, *ordinal*, and *scale* levels of measurement
- Distinguish between *nominal*, *ordinal*, and *scale* levels of measurement
- Determine the level of measurement appropriate for a variable
- Use SPSS features that *suggest* appropriate levels of measurement

Watch the tutorial video at study.sagepub.com/aldrich3e

4.2 VARIABLE VIEW SCREEN: *MEASURE* COLUMN

By this time, you should feel confident navigating the various menus and windows. You have used the Variable View screen when you named variables. You may have noticed that one column on the Variable View screen was called *Measure*. The function and use of this *Measure* column is the subject of this chapter. To help you understand the concept of levels of measurement, and the proper use of the *Measure* column in SPSS, you will need to open the data file you saved in Chapter 1 that you titled *eagles_expl.sav*.

- Start SPSS, and click **Cancel** to close the opening window.
- Click **File**, select **Open**, and then click **Data**.
- Click **eagles_expl.sav**, and then click **Open**.
- Click the **Variable View** tab (at the bottom of the screen), and then inspect the *Measure* column, which shows the level of measurement. (Prior to clicking on the *Measure* column, for a new dataset, it would read *Unknown*. After entering data, the most common SPSS default selection is *Scale*; however, in this case, the SPSS program made the correct decision and specified the *Nominal* level of measurement.) *Note:* Remember that SPSS sometimes assigns a level of measurement not compatible with your desired analysis.
- Click the **cell** below the *Measure* column. (You will see a drop-down menu displaying *Scale*, *Ordinal*, and *Nominal*, as shown in Figure 4.1.)

FIGURE 4.1 ⬢ VARIABLE VIEW SCREEN: *MEASURE* COLUMN DROP-DOWN MENU

These three choices, as shown in Figure 4.1, are known as *levels of measurement*, which is the subject of this chapter.

In earlier versions (pre-22) of SPSS, the program would most frequently select *Scale* for numerical data entered in the Data View spreadsheet. SPSS did not always make the correct decision when it designated data as having been measured at the *scale* level. SPSS now has added a default called *Unknown*, which is present when you enter data. If you fail to designate a level of measurement, SPSS will assign levels depending on the format of the data and any attempted analysis you may do.

Note: The SPSS program could not then, and still cannot, consistently recognize the correct level of measurement that was used to measure your variables. Because of this, you, the person trying to make sense of the data, must understand whether the variables were measured at the *nominal*, *ordinal*, or *scale* levels.

Once you determine the correct level of measurement for your variables, you then specify this in the *Measure* column of the Variable View screen. The following pages spend time and ink showing how to determine levels of measurement for each of your variables. By the end of this chapter, you will feel confident that you have assigned the correct level of measurement, therefore making sure that the SPSS Statistics software fully understands your data.

SPSS recognizes three levels of measurement that should be considered as a hierarchy: *nominal* (lowest level), then *ordinal* (middle level), and finally *scale* (highest level). This hierarchy (lowest, middle, and highest) refers to the amount of analyzable information contained in the numbers (your data) resulting from your counting or measurement of your observations. Figure 4.2 shows the icons used by SPSS to designate these three levels of measurement. Once the assignment of levels of measurement is made, SPSS automatically attaches these icons to your variables—allowing you to quickly identify this important variable information.

FIGURE 4.2 ⬢ SPSS ICONS USED FOR LEVELS OF MEASUREMENT

Icon for variables measured at the nominal level: 

Icon for variables measured at the ordinal level: 

Icon for variables measured at the scale level: 

Let's look at a few examples that demonstrate these three levels of measurement, beginning with the lowest level, *nominal*.

4.3 VARIABLES MEASURED AT THE NOMINAL LEVEL

When a variable is said to have been measured at the *nominal* level, the numerical values only represent labels for various categories of that variable. It should be noted that when a variable is measured at the *nominal* level, the categories are often referred to as *attributes* of that variable. It is a common practice to refer to variables as being "measured" at the *nominal* level, but in reality, we are only counting the occurrences of the variable's attributes. The numbers used to represent various categories (attributes) contain the least amount of analyzable information of the three levels of measurement. We can only count and calculate the percentage of the total number of observations that occupy the various categories. When trying to make sense of the attributes of variables measured at the *nominal* level, we may use data tables and various charts such as bar and pie graphs to display the numbers and/or percentages of the various attributes that were observed. Additional analytic methods, both *descriptive* and *inferential*, for the attributes of variables measured at the *nominal* level are described in future chapters.

Variables having separate categories that are not related in terms of quality or quantity are said to be measured at the *nominal* level. An example of a variable measured at the *nominal* level is gender. Gender has two possible categories: female, which could be labeled as Category 1, and male, labeled as Category 2. You should note that the categories for gender, female and