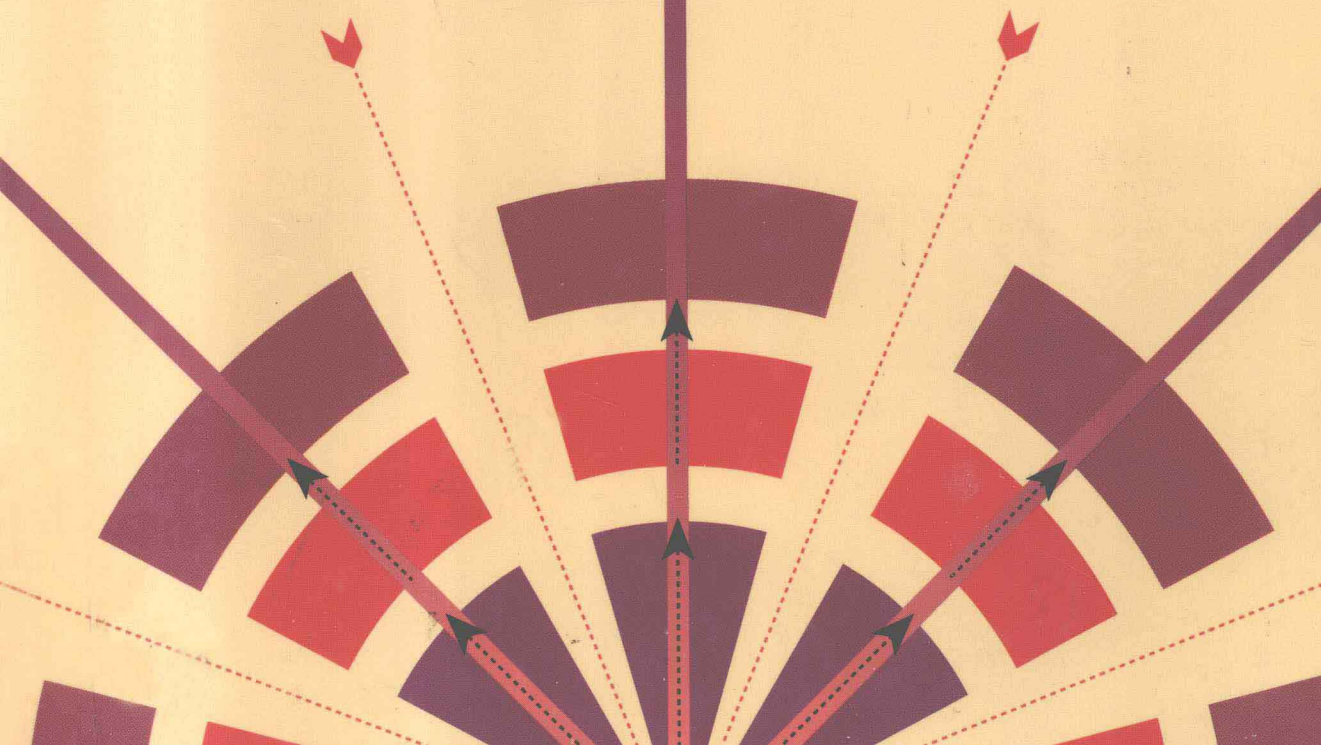
FOUNDATIONS for GATHERING and INTERPRETING BEHAVIORAL DATA

Robert Thomas Maleske



FOUNDATIONS FOR GATHERING AND INTERPRETING BEHAVIORAL DATA

An Introduction to Statistics

Robert Thomas Maleske
Carthage College

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I dedicate this work to Marianne, my wife, whose love, support, and patience are between the lines;

to Melissa, my daughter, whose love for reading inspires me to write;

to my sister, Carol Anne Maleske Restis, and brother-in-law, Robert Restis, who supported me in high school and college after the untimely deaths of my parents;

to Marianne's parents, Frank Adamczyk and Theresa Giacchino Adamczyk, who helped us in countless ways during our graduate school years;

in loving memory of my own parents, Thomas Joseph Maleske and Dorothy Kruder Maleske, whose lives and values continue in my writing;

and to my beloved grandmother, Ruth Anderson Kruder, who, at the age of 98, continues to inspire my growth.

PREFACE

Many textbooks are available to those who are studying statistical analyses; this is not one of them. This book is for those who want or are expected to gain a fundamental understanding of the *total process* of gathering and interpreting behavioral data, and who are willing to study the basic issues and concepts involved in this process, of which statistics is only a part.

At the heart of my motivation to write this book is a firm belief that we can understand new information more easily when we can connect it with our own experience. All of us have observed the behavior of people and things; asked questions based on our observations; made our interpretations; and tested the validity of our explanations with additional observations. This universal experience is the foundation—and the only prerequisite—for using this book.

As the title indicates, my overall objective is to help readers understand the *process* of gathering and interpreting behavioral data. You will notice in the table of contents that the headings almost always contain active verbs—for example, "Recognizing the difference between data and information." This is because I emphasize actual skills rather than abstract concepts.

This book is in part my response to other texts on elementary statistics and research methods. Typically, these books focus on inferential statistical analyses *per se*, as if understanding them were an end in itself; often, the names of statistical tests—*t*-tests, for example—will be used as chapter titles. In contrast, the structure of this book emphasizes developing skills and understanding concepts that are prerequisites to knowing when and how to use statistical analyses. Specifics regarding inferential analyses are postponed until Part Four, after a larger and more coherent context is in place.

Few students find statistics intrinsically interesting. However, I have found that they are more willing to absorb the material if it emphasizes logical concepts rather than complex statistical formulas. In that case, they can recognize its relevance to everyday decision making.

Acknowledgments

I used to wonder why authors go on and on with acknowledgments; now I understand.

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No textbook can be completed without a reality check. I appreciate the efforts of Steve Prosavac and Yi-Chun Sun of the University of Utah, who tested all the calculations, and the contributions of my students and of all readers—past, present, and future—who respect my work enough to challenge it and make thoughtful suggestions for improvement.

I could not have kept my nose to the word processor day after day without the support of my colleagues: Larry Hamilton, whose wisdom and sensitivity helped me keep everything in perspective; Ingrid Tiegel, whose professional commitment provided me with a model of persistence; George Catlin, who helped me balance the statistical with the spiritual; and Donald Michie, whose encouragement and respect added to my confidence.

To all my friends and relatives, too numerous to mention, whose encouragement and support were like fresh breezes during the doldrums every writer confronts; and to our good friend Judy Krieger, who gave Melissa a wonderful place to be when I had deadlines and Marianne had professional commitments: Thank you!

In closing, I want to recognize the wisdom of Albert Erlebacher, whose good advice during my graduate years at Northwestern has stayed with me during twenty years of teaching, and which I continue to pass on to my students: Never collect research data until you know which statistics will be appropriate!

Robert Thomas Maleske

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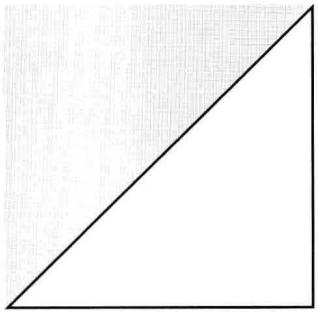
AN OVERVIEW

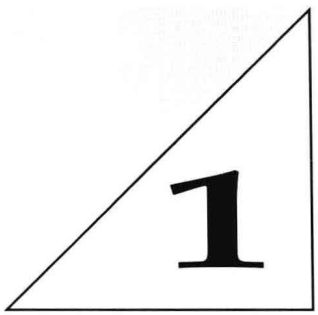


1

Understanding the Total Process of Gathering and Interpreting Data

Although Part One consists of only one chapter, it is not merely a polite opening leading to the meat and potatoes of later chapters. The material in Chapter 1 lies at the core of everything that follows. Its message is that gathering data and interpreting data are not discrete processes; they are but steps in a total process. The individual chapters that follow provide the foundations for understanding that process and how the separate steps work together.

Understanding the Total Process of Gathering and Interpreting Data



Observing, Questioning, Explaining, Predicting
Data versus Information
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Formal versus Informal Processes
The Total Process of Gathering and Interpreting Data
Descriptive Statistics versus Inferential Statistics
Populations and Samples
Representativeness
Random Selection
Overview of this Book
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OBJECTIVES

After reading and studying Chapter 1 you should understand the following.

- *making observations, formulating questions, explaining observations, and making predictions are fundamental to human existence.*
- *the difference between data and information.*
- *the difference between interpreting information and making a decision based on that information.*
- *the difference between formal and informal approaches to gathering and interpreting data.*
- *gathering and interpreting data are not separate processes but elements of a total process.*
- *the difference between descriptive and inferential statistics.*
- *the difference between populations and samples.*
- *representativeness.*
- *random selection.*
- *the overall structure of this textbook.*

OBSERVING, QUESTIONING, EXPLAINING, PREDICTING

For all organisms, including humans, survival depends on responding and adapting to conditions in the environment. To respond and adapt means to (*a*) observe what is going on, (*b*) ask questions about why things happen as they do, (*c*) seek explanations for our questions, and (*d*) make predictions about what might happen. The more successful we are at responding and adapting, the more likely we are to "live long and prosper," in the words of Mr. Spock.

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