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FOR THE

SOCIAL AND

BEHAVIORAL

SCIENCES

David A. Kenny

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Table 13.1, Table 13.2, Table 16.1, and Table 16.2: From Jacob Cohen, *Statistical Power for the Behavioral Sciences*, Rev. ed. (New York: Academic Press, 1977). Adapted by permission.

Problem 13.14 and Problem 18.16. From Randy L. Diehl, Keith R. Kluender, and Ellen M. Parker, "Are Selective Adaptation and Contrast Effects Really Distinct?" *Journal of Experimental Psychology: Human Perception and Performance* 11 (1985), Table 1, p. 215. Copyright 1985 by the American Psychological Association. Adapted by permission of the author.

Appendix C and Appendix H: From Donald B. Owen, *Handbook of Statistical Tables* (Reading, MA: Addison-Wesley, 1962), Table 1.1, pp. 3–10, Table 11.4, pp. 349–353. © 1962 by Addison-Wesley Publishing Company, Inc. Adapted with permission.

Appendix D: From Enrico T. Federighi, "Extended Tables of the Percentage Points of Students' *t*-Distribution," *Journal of the American Statistical Association* 54 (1959): 683–688. Adapted by permission.

Appendix E: From Egon S. Pearson and Herman O.

Hartley, *Biometrika Tables for Statisticians*, Vol. 1, 3rd ed. (Cambridge: The University Press, 1972), Table 18, pp. 169–175. Adapted with the kind permission of Egon S. Pearson and the Biometrika Trustees.

Appendix G: From Table IV of Ronald A. Fisher and Frank Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, 6th ed. (London: Longman Group Ltd., 1974; previously published by Oliver & Boyd Ltd., Edinburgh). Adapted by permission of the authors and publishers.

Appendix I: From Gerald J. Glasser and Robert F. Winter, "Critical Values of the Coefficient of Rank Correlation for Testing the Hypothesis of Independence," *Biometrika* 48 (1961), Table 2, p. 446. Adapted by permission.

Pp. 39, 125, 126, 143: Life-expectancy data is from U.S. Bureau of the Census, *Statistical Abstract of the United States 1984*, 104th ed. (Washington, DC: United States Government Printing Office, 1984), p. 861.

P. 142: Hurricane data is from *Information Please Almanac* © 1983 (Boston: Houghton Mifflin Co., 1983), p. 431.

*To my children,
Katherine, Deirdre, and David*

Preface

A few years ago, I found myself in the emergency room of the local hospital. While painting my house, I had fallen through a window and cut both my arms. As a nurse busily worked to stop the bleeding, she asked me what I did for a living. I told her I taught psychology. My response apparently interested her, and she eagerly asked me what area of psychology I taught. When I said statistics, she was quite disappointed. I told her that I found statistics to be fun and exciting; she thought I must be crazy. Probably many of the student readers of this text (and perhaps a few of their instructors as well) feel the same way about statistics as the nurse did. It is my hope that this text will make students and instructors fear the topic less and even make a few of you enjoy the topic as much as I do.

This textbook is written for students majoring in the social and behavioral sciences. It provides a first course in data analysis. Students should learn the basic methods that social and behavioral scientists use in analyzing data to test hypotheses. The book is intended to be comprehensible to students who are not planning to go on to postgraduate study, but I have also included material to prepare students for graduate school. Even the active researcher may find the book a useful resource, because I have covered many practical issues that are not typically included in textbooks.

The book begins with a general introduction to the major terms in data analysis. The next seven chapters present procedures that have been developed to describe data. Measures of central tendency, variability, and association are presented. Chapters 9, 10, and 11 introduce the key concepts that underlie the drawing of statistical conclusions. Presented are sampling, the normal and binomial distributions, and sampling distributions. The final seven chapters discuss statistical models, and the standard tests of statistical significance are presented here as well.

Much of the computation of statistics is no longer an unpleasant and laborious task. With the easy access to computers and calculators today, an undergraduate can do the statistical computation in five minutes that used to take a Ph.D. statistician weeks to do. This book recognizes this fact and emphasizes interpretation and understanding as opposed to computation.

Some students understandably feel intimidated by statistics and its formulas and nomenclature. One way to lessen their fear is to make the style of presentation informal. I have avoided numbering sections and formulas and have tried to use words instead of symbols whenever possible. In fact, many of the formulas are stated in terms of words instead of abstract symbols.

Another way to increase comprehensibility is to use many examples. I have included examples from the areas of nonverbal communication, teacher expectancies, vandalism, age and short-term memory, obedience to authority, voting in Congress, and many others. Where possible, I present actual data instead of made-up numbers. Examples are drawn from psychology, education, genetics, public policy, business, sociology and anthropology, medicine, and meteorology.

I have also attempted to make the book very practical and to discuss topics that professional researchers face with real data. Many of the classical topics in statistics (e.g., selecting balls from urns) are of interest to the statistician, but their abstract discussion is of little value to the undergraduate who is struggling with the topic for the first time.

A related goal of mine was to include important topics that are not covered in enough detail in many statistics texts. I have incorporated much more material on the effect of unusual data points, issues of data transformation, repeated measures designs, and model testing than is found in most contemporary texts.

Modern data analysis, whether the discipline is psychology or economics, or whether the design is experimental or observational, uses primarily correlational techniques. This book has four chapters on the subject of correlation and regression and contains much more detail than most of the statistics texts that are currently available. The purpose of the text is to feature data analysis techniques that are being used now and will be increasingly used in the future, and to avoid the discussion of techniques that are no longer used but were important many years ago.

The task of writing a book is always a collective effort that extends beyond the listed authors. This was certainly true of my endeavor. I would first like to acknowledge the assistance of my reviewers: David Chizar, the University of Colorado, Boulder; Jon A. Christopherson, formerly of the U.S. Coast Guard Academy; Charles M. Judd, the University of Colorado, Boulder; Katherine W. Klein, North Carolina State University; Thomas E. Nygren, the Ohio State University; Mike Raulin, State University of New York at Buffalo; Howard M. Sandler, Peabody College of Vanderbilt University; Robert Seibel, the Pennsylvania State University; Joseph B. Thompson, Washington and Lee University; and Anthony A. Walsh, Salve Regina—the Newport College. They patiently educated me about a number of important issues.

Special thanks are due to those at Little, Brown who guided this project. Tom Pavela convinced me that I could write a book in this area that would be new and exciting. Molly Faulkner took what was only an outline and de-

veloped it into a plan for a book. And Mylan Jaixen took charge of the difficult task of bringing the book into production. Barbara Breese of Little, Brown and Melinda Wirkus turned the manuscript into a book.

A number of my colleagues and students read various chapters and provided important feedback. In the early stages, Cindi Zagiebroylo and Lisa Cassady provided me with helpful comments. Later, Thomas Malloy and especially Claire Harrison carefully read each number and word.

I also wish to thank colleagues who provided me with data. In particular, Bella DePaulo gave me a fascinating data set that is described in Chapter 2. Also, Starkey Duncan and Don Fiske are thanked for the data described in Chapters 5 and 7. Finally, the data in Chapter 6 relating age and short-term memory were gathered by the late Dennis Ilchisin.

A project of this length requires extensive clerical support from many people. I want to acknowledge their crucial assistance. In the early stages, Mary Ellen Kenny and Robyn Ireland typed numerous drafts of the chapters. It was Robyn Ireland who put the manuscript onto a word processor. Over the last year, Claire Harrison handled all the clerical details. Without her assistance, the book would have been delayed considerably.

I am grateful to the literary executor of the late Sir Ronald Fisher, F.R.S.; to Dr. Frank Yates, F.R.S.; and to Longman Group—London, Ltd., for permission to reprint Table IV from *Statistical Tables for Biological, Agricultural and Medical Research* (6th ed., 1974).

Finally, my home institution, the University of Connecticut, provided me with the resources and support to undertake this effort. I completed the project at the Psychology Department of Arizona State University.