FUNDAMENTALS OF BEHAVIORAL STATISTICS

Eighth Edition

Richard P. Runyon
Audrey Haber
David J. Pittenger
Kay A. Coleman

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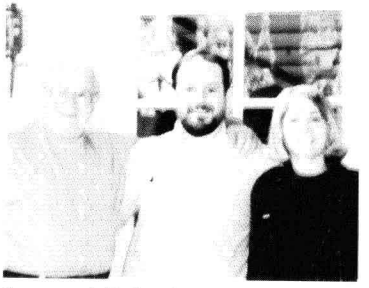

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Preface

Little did the authors suspect that when the first edition of this book was born it would someday enter into its fourth decade of widespread acceptance in the groves of academe. The widespread and continued use of this text has been a source of deep satisfaction to its authors.

One major change should be noted as the text moves into its eighth edition. Because of heavy responsibilities in her private practice, Audrey Haber has regrettably "retired" from continued authorship of *Fundamentals of Behavioral Statistics*. She will be missed. However, she has been replaced by two outstanding colleagues who are highly knowledgeable and ardent mentors in the field of statistics: Kay A. Coleman and David J. Pittenger. Many of the alterations in the text, which have been warmly praised by reviewers of the manuscript for the eighth edition, are directly due to their astute thought and extensive experience in teaching statistics.

As in previous editions, our goal has been to respond to instructional changes that have been wrought by the multitude of data-processing advances that have occurred over the past thirty years. Much progress has been made during this relatively short time period. Just three decades ago, processing data involved paper and pencil calculations, with occasional service from slide rules and noisy, recalcitrant mechanical calculators. The next step involved first generation calculators and computers that, because of their size and expense, occupied primarily a single facility in a college or university and were run by a rare breed, the computer specialists. Now we are generously endowed with compact "throw away" pocket calculators and diminutive computers with enormous data-storing and data-processing capabilities. With the diminishing cost of these present-day computers, each individual has the capability of becoming a user specialist.

These changes have, of course, exerted strong influences on the teaching of statistics. Less time and effort need be consumed on the mechanics of computation and can be replaced by attention to diverse and more important topics, such as the rationale underlying research design and statistical analysis. To illustrate, such topics as statistical power and effect size are now recognized as crucial as the conventional

tests of statistical significance when planning a research venture. Thanks to the work of Jacob Cohen (*Statistical Power Analysis for the Behavioral Sciences*), his extensive sets of easily-used and readily-understood tables have relieved much of the tedium of conducting power analysis. Thanks to Cohen's work, we have deleted Chapter 16 from our text (Power and Efficiency of a Statistical Test) and have integrated it, where appropriate, within individual chapters. As one reviewer of our manuscript observed, "The organization was a particularly effective use of convention combined with innovation. The inclusion of material on power and effect size . . . was very effective and complete."

We have previously noted that the advent of the computer is not necessarily an unmixed blessing. Along with the obvious benefits of the computer, there also arise some risks. There is a temptation to collect a batch of data and, with cursory examination at best, enter it immediately into computer data files. In doing so, we lose contact with our raw data and may overlook important aspects of these data, such as outliers and even errors in values entered into the data files. In this edition, we have extended the examination of John W. Tukey's exploratory data analysis (EDA), including stem-and-leaf plots as alternative forms of frequency distributions and cumulative frequency distributions. We have even demonstrated that it is possible to introduce box-and-whisker plots to compare different distributions in terms of measures of central tendency and dispersion. As pointed out by Tukey (1977), "The greatest value of a picture is when it *forces* us to notice what we never expected to see."

Those who desired greater coverage of analysis of variance (ANOVA) should not be disappointed. We have included effect size and power in Chapter 13 as well as Tukey's honestly significant difference (HSD) in Chapters 13 and 14.

Incidentally, in deference to the truth in the aphorism that a picture is often worth a thousand words, we have paid particular attention to figures and graphs in this edition. Indeed, the use of graphic techniques is the main topic of Chapters 3 and 6. In addition, we have expanded our use of graphics throughout the text. For example, the two-way analysis of variance chapter includes ten figures plus an additional figure that includes six "pictures" that illustrate varying main and interaction effects of a two factor ANOVA.

Some of our loyal users complained that such features as boxes, case examples, and "Statistics in Action" often impede the continuity of the text and lead to confusion among the students. In response to these fine suggestions, we have removed these amenities and, wherever reasonable, have incorporated them into the text.

A textbook of this sort is a collaboration of many individuals with their contributions meriting more than a mention in the preface. First, there are those who write unsolicited letters to us to bestow compliments for a job well done or to chastise us when we drop the ball. We appreciate both the praise and the censure: the first for boosting our egos and

the second for helping us improve our performance in a shared mission—instruction in one of the most important courses in the curriculum. A second group of individuals subjects itself to the agony (without the ecstasy) of reading the entire text and making detailed suggestions, many of which are incorporated into the text. They have our undying admiration and appreciation.

We wish to thank the following reviewers for their most generous contributions of their time and talents: Jay Alperson, Palomer College; Edward A. Arees, Northeastern University; Stephen E. Buggie, University of New Mexico at Gallup; Sheila Burns, Northern Michigan University; Dennis Cogan, Texas Tech University; Kathleen Dillon, Western New England College; Dana Dunn, Moravian College; Ronald A. Finke, Texas, A&M University; Paul I. Hettich, Barat College; Steven Katzman, Illinois Institute of Technology; Philip Merrifield, New York University (retired); Michael Palij, New York University; and Richard L. Rodgers, Georgia Southern University.

Finally, we would be remiss if we did not acknowledge the exceptionally fine support of our co-producers at McGraw-Hill. Tom Holton calmly and amiably supervised the production of this book; Brian McKean provided valuable help and support during the revision stages of the manuscript.

We wish to express our deep appreciation to Lois A. Runyon who cheerfully hosted both bed and breakfast, and more, when the three authors met in the Runyon home to work out the many details in the eighth edition of FBS.

We are grateful to the Literary Executor of the late Sir Ronald A. Fisher, F.R.S., to Dr. Frank Yates, F.R.S., and the Longman Group Ltd., London, for permission to reprint Table III from their book *Statistical Tables for Biological, Agricultural, and Medical Research* (sixth edition, 1974).

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