Review of
The Application of Statistics to Policy Analysis and Management: An Introduction
By John Rohrbaugh:
Three-Part, User-Friendly Textbook Increases
Odds of Practitioners Learning Statistical Analysis

Review by Andrea E. Mayo
Arizona State University

INTRODUCTION

Teaching statistics in public administration, policy, or management, as opposed to other social sciences, provides a special challenge. Because public affairs is an interdisciplinary field, students often come from a variety of backgrounds within the social sciences — and from outside them, too. At the master's level, some students may have substantial familiarity with statistical analysis, while others may be completely new to the subject. Finding appropriate materials to balance the needs of a diverse group of students and their varying levels of familiarity with statistics is a challenge faced by anyone who teaches statistics or quantitative methods in public affairs. John Rohrbaugh's (2009) *The Application of Statistics to Policy Analysis and Management: An Introduction* draws on his 30 years of experience spent teaching statistics to graduate students in public affairs. It offers an inexpensive and more-approachable alternative to commonly used statistics textbooks, and provides public affairs students with real-world examples of how statistical analysis can be applied to policy, management, and administration. An excellent resource for beginners and practitioners, it may be too simple for those who move on to more advanced statistics.

Rohrbaugh's focus on approachability is clear before one even begins to read. Rather than creating one large textbook, he divided it into three workbooks — two that discuss descriptive statistics and one that discusses inferential statistics. The workbooks are short (only four chapters each) and are inexpensively bound, which cuts down on students' costs. They also lie flat. Rohrbaugh designed the books so that each lesson is displayed on two pages, which allows students to see each lesson in full when they spread open the book on a tabletop. Further, the fact that the workbooks are small and portable makes it extremely easy for

students to carry them to class, the library, work — or anywhere. The book's design is probably its most appealing element. By redefining the substance of a statistics textbook, Rohrbaugh subtly has made the subject matter more accessible and appealing to students who might be intimidated or discouraged by statistical analysis. It is not surprising to learn that Rohrbaugh is a psychologist by training.

Although Rohrbaugh designed *The Application of Statistics to Policy Analysis and Management* based on his experience teaching statistics to graduate students, it could be used for basic introductory statistics courses at either the undergraduate or graduate level. Professors teaching in practitioner programs likely will find Rohrbaugh's book to be among the most appropriate statistics texts available. On the other hand, students and professors in highly quantitative master's programs may require more rigorous preparation than Rohrbaugh's book provides, in order to enable them to progress to advanced regression or applied econometrics courses. These students likely will find better resources in Joseph F. Healey's *Statistics: A Tool for Social Research* (2004) or Lawrence L. Giventer's *Statistical Analysis for Public Administration.*

Each of Rohrbaugh's three workbooks is subdivided into four chapters. There are overviews of the contents for each chapter, as well as a list of important terms that are discussed. Part I, the first workbook, focuses solely on *univariate descriptive statistics*, after an introduction to the study of statistics and an overview of conceptualization, operationalization, and measurement. From there, Part I continues on to distributions, central tendency, variability, and reporting statistics.

Chapter 1 opens with an interesting story about the origins of statistics and the positivist perspective on social science. It also discusses the purpose and structure of the book. The first two lessons in Chapter 2 are peppered with examples of statistics being used in the popular media. These examples provide cases that public administration students are likely to find interesting and relevant to their work. Chapter 1's third lesson touches on *validity, reliability,* and *units of analysis and measurement.* In two pages, Rohrbaugh in a clear and straightforward way is able to explain concepts that students often struggle to understand. His final lesson in Chapter 1 covers precision and rounding.

Chapter 2 starts with the most *basic forms of descriptive statistics*, as in categorization, frequencies, percentages, and proportions. A significant portion of the chapter covers the *graphical presentation of these statistics*. A shortcoming of this chapter is Rohrbaugh's discussion of *how to hand-draw polygons*, histograms and ogives. Very few students will be required to hand-draw graphs outside of the classroom; this space might have been put to better use by describing how to construct each of these graphs in Microsoft Excel or a similar program. By contrast, he offers very strong discussions of the decision-making process that researchers use when deciding how to present data, plus the common forms of graphical distortion. Chapter 2 provides a solid guide to presenting descriptive statistics in a report.

Chapters 3 and 4 discuss measures of *central tendency and variability*. Rohrbaugh's discussion of measures of central tendency not only define mode, median, and arithmetic mean, but also illustrate how data distributions affect their magnitudes in relation to each other and their utility for cross-time and cross-data comparisons. Chapter 4 discusses *measures of variability*, including standard deviation. In both chapters, Rohrbaugh's graphical representation of concepts provides substantial explanatory value, and complements the narrative explanations well.

Part II, the second workbook, covers *bivariate descriptive statistics*. It begins by describing the relationships between qualitative and quantitative data. It then moves on to *bivariate regression*, and concludes with *multiple regression*. It should be noted that this workbook only addresses the descriptive nature of each of these relationships, and does not touch on issues of statistical significance, which are discussed in the third workbook.

The discussion of relationships between two variables is divided into *qualitative data* (Chapter 5) and *quantitative data* (Chapter 6). I believe that dividing the chapters in this way will reduce students' apprehension and uncertainty about what tools to use, and when. On page 82 of Chapter 5, Rohrbaugh uses a decision tree to determine which measures of association to use for qualitative data. This chart is a helpful guide for anyone doing statistical work, not just introductory statistics students. Rohrbaugh's Chapter 6 provides an excellent discussion of *correlation versus causation*. Once again, his graphical representations of relationship strength and type are notable for their ability to clarify meanings for students.

Workbook II closes with a discussion of *bivariate regression* in Chapter 7, followed by *multiple regression* in Chapter 8. It is in these last two chapters that the strategy of dividing inferential and descriptive statistics seems jarring for professors and students who are already familiar with statistics. Many comparable books leave *multiple regression* to the last chapter (Giventer, 2008; Sirkin, 1999; Healey, 2004). And, many statistics courses also end with *multiple regression*. Rohrbaugh discusses it two-thirds of the way through his book, divorced from statistical significance, which is a unique approach. Of all his chapters, I found his discussion of multiple regression to be the most confusing, but perhaps this was because his take on regression is so different from the approach in other books. I personally find Sirkin's (1999) discussion of multiple regression to be more straightforward and easier to understand.

Rohrbaugh's third workbook discusses *inferential statistics*. He separates inferential statistics from univariate and bivariate statistics because he finds that many agencies have data on whole populations, which means many public management practitioners will not need inferential statistics as often as those in other disciplines. I'm not sure that this is a generalizable statement for the entire field. Practitioners and scholars working on program evaluation certainly

deal with samples more often than whole populations. However, the separation of inferential statistics from descriptive statistics makes it clear when inferential statistics are necessary and what they mean.

In Chapter 9, the third workbook begins by discussing the *logic of sampling*. It explains the difference between the population and the sample, and explains how random samples may or may not match the population. Rohrbaugh also introduces the normal curve in this chapter, along with the z-statistic. For some reason, he rounds the z-statistic to just one decimal place. Generally, scholars round the z-statistic to at least two, if not three, decimal places. While this certainly helps students to remember the critical statistical levels, it may be too imprecise for more advanced students. Additionally, he uses only the z-statistic, never the t-test for statistical significance. While this distinction may be unimportant to practitioners, the z-statistic is rarely used in inferential statistics. This is another imprecision, which shows that, while the book is useful for practitioners and those who need to understand basic statistics, it is too imprecise for those who wish to advance to more rigorous courses in statistical analysis.

Chapters 10 and 11 cover *inferences* with one and two samples, respectively. Both chapters are structured in the same way, with the same relevant terms. The final chapter explains *confidence intervals* and the estimation of population parameters. Rohrbaugh's strategy for calculating statistical significance is straightforward and can be done without a z-statistic table. He walks through the calculation with words rather than equations, taking much of the math out of it.

This last workbook truly illustrates who will benefit from the use of this text and who might find it too remedial. Rohrbaugh's calculation for statistical significance begins with a decision about the level of risk of Type I Error that the student is comfortable with. From there the student basically calculates the appropriate confidence interval — using a z statistic rather than the standard t — and if the sample value falls outside of it, then the null is rejected. With this procedure, neither the t- nor the z-statistic is ever calculated. Additionally, because Rohrbaugh rounds his numbers, a z-score of 2.0 is estimated to be a 95 percent confidence interval for a two-tailed test. On the one hand, this makes it an easy calculation for practitioners and those who only require a simplistic way to judge statistical significance. For students who will be continuing on to more advanced statistics, or who already have had some statistical training, this method of calculation may seem too imprecise.

There are many consistent strong points throughout all three of the workbooks. Rohrbaugh's exceptional use of graphics presents the material well. I already have mentioned his decision tree at the end of Chapter 5, but all four of his decision trees are really useful ways to help students decide not only how to report their data, but also which types of statistics they should be looking for when they read reports. Finally, in each chapter, Rohrbaugh presents computations of statistics in yellow break-out boxes. These boxes walk students through the calculations of statistics in a step-by-step manner that is neither

intimidating to look at nor to follow.

John Rohrbaugh's *The Application of Statistics to Policy Analysis and Management: An Introduction* is a welcome addition to the statistics-for-social-science textbook market. By creating a text with the goals of accessibility and simplification in mind, he has not only made the study of statistics comprehensible to students who do not think quantitatively, but he also has re-thought the idea of what a textbook is and can be. While more quantitative programs likely will require a different textbook, any student who struggles with statistics will appreciate and be able to learn from Rohrbaugh's approach. Further, his textbook seems to be perfectly tailored to programs that teach primarily practitioners or undergraduates. I highly recommend that professors who teach statistics in public administration consider Rohrbaugh's text as either the main course textbook, or as a supplementary resource for students without prior training in statistical analysis.

REFERENCES

Giventer, L.L. (2008). *Statistical analysis for public administration* (2nd ed.). Sudbury, MA: Jones and Bartlett.

Healey, J. F. (2005). *Statistics : A tool for social research* (7th ed). Belmont, CA: Thomson/Wadsworth.

Rohrbaugh, J. (2008). *The application of statistics to policy analysis and management: An introduction.* Albany, NY: Executive Decision Services, LLC.

Sirkin, R.M. (1995). *Statistics for the social sciences.* Thousand Oaks, CA: Sage Publications.

Andrea E. Mayo is currently a Ph.D. student in the School of Public Affairs at Arizona State University. Her primary interests include research methods, public policy analysis, the intersection of democracy and the policy process, social welfare policy, and health care policy. She has a B.A. in Sociology and Anthropology from Colgate University and a Master's in Public Policy from Georgetown University.