Number 137
Tuesday, August 16, 2:00 p.m. - 3:50 p.m.
IMPROVING TEACHING OF GRADUATE LEVEL STATISTICS SERVICE COURSES - **Invited Papers**
Sec. on Stat. Education, Sec. on Stat. Consulting, Sec. on Teaching of Stat. in Hlth. Sci., Sec. on Quality & Productivity.
Organizer: RONALD G. MARKS, U of Florida
Chair: DAVID M. NICKERSON, U of Central Florida
(2:05) Helping Students Create Value for Statistical Thinking. RONALD D. SNEE, Joiner Assoc., Inc.
(2:30) Motivating Students to Learn in Statistics Services Courses. RONALD G. MARKS, U of Florida
(2:55) Teaching Graduate Service Courses Through Case Studies. FRED RAMSEY, DANIEL SCHAFER, Oregon State U
(3:20) Disc: ROBERT V. HOGG, U of Iowa
(3:35) Floor Discussion

Number 168
Tuesday, August 16, 4:00 p.m. - 5:50 p.m
SHORT COURSE: CHALLENGES, ISSUES, AND EDUCATIONAL VALUE - **Invited Papers**
Section on Teaching of Stat. in Hlth. Sci., Sec. on Stat. Educ., Sec. on Stat. Consulting
Chair/Organizer: MICHAEL H. KUTNER, Cleveland Clinic Foundation
(4:05) Teaching Short Courses in Biostatistics and Epidemiology. DAVID G. KLEINBAUM, Emory U
(4:30) Ten Suggestions for Effectively Teaching Short Courses to Heterogeneous Groups. JEFFREY B. BIRCH, VPI & State U
(4:55) Challenges in Teaching Short Courses by an Academic Department: The University of Florida Experience. JOHN A. CORNELL, RONALD RANDLES, G. GEOFFREY VINING, U of Florida.
(5:20) Disc: MICHAEL H. KUTNER, The Cleveland Clinic Foundation
(5:35) Floor Discussion

Number 270
Thursday, August 18, 8:30 a.m. - 10:20 a.m.
THE FIRST DAY OF CLASS - **Invited Papers**
Sec. on Stat. Educ., Sec. on Teaching of Stat. in Hlth Sci.
Chair/Organizer: KATHERINE T. HALVORSEN, Smith Coll.
(8:35) My First Day's Lectures: Past and Present. DONALD L. BENTLEY, Pomona Coll.
(9:00) Tricks of the Trade: Getting Going the First Day. ROBIN H. LOCK, St. Lawrence U
(9:25) Alternative First Days. DOUGLAS A. ZAHN, Florida State U
(9:50) What Should You Do the First Day: How to Motivate and Set Goals. FLETCHER BLANCHARD, Smith Coll.
(10:15) Floor Discussion

Remember
Business Meeting &
"Joint" Mixer!!
Monday night, 5:00 p.m.

Number 228.

Poster Sessions - Contributed Papers
Wednesday, August 17, 12:00 p.m. - 2:00 p.m.
(Letter indicates booth assigned)
Sec. on Teaching of Stat. in Hlth. Sci.
W. Study of Biostatistics Requirements in
Medical Schools in the United States.
CHRISTOPHER GRADY, STEPHEN W.
LOONEY, R. PRASAAD STEINER, U of
Louisville.

BOOK REVIEW

Principles of Biostatistics,
by Marcello Pagano and Kimberlee Gauvreau.
Duxbury Press, Belmont, CA, 1993.

Review by **Allan H. Reed**, Wayne State University
School of Medicine, Detroit, MI 48201

Although there are many textbooks for a first
course in statistical methods, instructors of courses
in biostatistical methods have a far smaller choice.
I teach such a course to graduate students in the
health sciences and selection of the appropriate
text often presents a problem. Student prior
preparation for this course is quite varied - ranging
from calculus through differential equations in
some cases, and nothing more than high school
algebra taken some years ago, in other cases.
Some students are employed in a local hospital or
other medical facility. The other large source of
students is from curricula in the basic medical
sciences of the Medical School. An appropriate
textbook for these types of students is one that
provides an introduction to the most widely used
biostatistical methods but does not overwhelm
them with excessive details - details that may be
appropriate for Biostatistics majors.

The Pagano-Gauvreau textbook was used when
the course was last taught, in the winter semester,
1994. In this review I will discuss its merits and
demerits vis a vis the audience mentioned above.

First, a summary of chapter contents: 1)
Introduction. 2) **Data Presentation.** Types of
Numerical Data (Nominal, Ordinal, Ranked,
Discrete, Continuous); Tables (Frequency
Distributions, Relative Frequency); Graphs (Bar
Charts, Histograms, Frequency Plots, Line Graphs).
3) **Numerical Summary Measures.** Measures of
Central Tendency (Mean, Median, Mode); Measures
of Dispersion (Range, Interquartile Range, Variance
and Standard Deviation, Coefficient of Variation);
Grouped Data; Chebychev's Inequality. 4) **Rates
and Standardization.** Rates; Standardization of
Rates (Direct Method of Standardization, Indirect
Method of Standardization). Use of Standardized
Rates. 5) **Life Tables.** Computation of the Life
Table; Applications: Years of Potential Life Lost. 6)
Probability. Operations on Events: Conditional
Probability; Bayes' Theorem; Diagnostic Tests
(Sensitivity and Specificity, Applications of Bayes'
Theorem, The ROC Curve); Calculation of
Prevalence; Relative Risk and Odds Ratio. 7)
Theoretical Probability Distributions. Binomial;
Poisson; Normal. 8) **Sampling Distribution of the
Mean.** Sampling Distributions; The Central Limit
Theorem. 9) **Confidence Intervals.** Two-Sided;
One-sided; Student's t Distribution. 10) **Hypothesis
Testing.** General Concepts; Two Sided Tests of
Hypotheses; One Sided Tests of Hypotheses; Types
of Error; Power; Sample Size. 11) **Comparison of
Two Means.** Paired Samples; Independent Samples
(Equal Variances, Unequal Variances). 12) **Analysis
of Variance.** One Way ANOVA; Multiple
Comparisons Procedures. 13) **Nonparametric
Methods.** The Sign Test; The Wilcoxon Signed
Rank Test; the Rank Sum Test; Advantages and
Disadvantages of Nonparametric Methods. 14)
Inference on Proportions. Normal Approximation
to the Binomial Distribution; Sampling Distribution
of a Proportion; Confidence Intervals; Hypothesis
Testing; Sample Size Estimation; Comparison of Two
Proportions. 15) **Contingency Tables.** The Chi-
Square Test; McNemar's Test; the Odds Ratio;
Berkson's Fallacy. 16) **Multiple 2 x 2 Tables.**
Simpson's Paradox; The Mantel-Haenszel Method
(Test of Homogeneity, Summary Odds Ratio, Test of
Association). 17) **Correlation.** The Two-Way
Scatter Plot; Pearson's Correlation Coefficient;
Spearman's Rank Correlation Coefficient. 18)

Simple Linear Regression. Regression Concepts; The Model (The Population Regression Line, The Method of Least Squares, Inference for Regression Coefficients, Inference for Predicted Values); Evaluation of the Model (The Coefficient of Determination, Residual Plots, Transformations). 19) **Multiple Regression.** The Model (The Least Squares Regression Equation, Inference for Regression Coefficients, Evaluation of the Model, Indicator Variables, Interaction Terms); Model Selection. 20) **Logistic Regression.** The Model (The Logistic Function, The Fitted Equation); Multiple Logistic Regression; Indicator Variables. 21) **Survival Analysis.** The Life Table Method; The Product-Limit Method; The Log-Rank Test. 22) **Sampling Theory.** Sampling Schemes (Simple Random Sampling, Systematic Sampling, Stratified Sampling, Cluster Sampling); Sources of Bias. **Appendix A:** Tables. **Appendix B:** Data Sets. **Appendix C:** Solutions to Selected Exercises.

Each of the chapters ends with a section called "Further Applications," followed by "Review Exercises," followed by "References." The exercises usually use real data from recent articles in the medical literature, and the articles are cited in the references. In most chapters one or more of the problems are intended to be solved by computer. For these problems data are provided on a diskette that comes with the book.

Although the problems at the end of the chapter are excellent I found that there were too few of them. Typically a chapter will have about five problems, each one consisting of several parts and using the same data set. The book is especially lacking in drill exercises.

There are several positive features of this book that are worth noting. First, it is well written. Students have told me that they found it easy to follow. Second, the medical orientation of the book and the use of real data helps the health sciences student who is focused on applications to maintain interest. Third, although the text has a substantial number of equations, the authors have made an effort to keep notation as simple as possible.

This last feature can also be viewed as a negative, rather than a positive aspect. For example, the notation for a normal deviate, Z_α, is never introduced. Consequently, for determining sample size needed to achieve a given power in the one sample hypothesis testing problem, the authors state:

"When $\alpha = 0.01$ and $\beta = 0.05$, the general formula for sample size can be written:

$$n = \frac{((2.32 - (-1.645))\sigma)^2}{(\mu^1 - \mu^2)}$$ "

Lacking the Z_α notation, this is as close as the text gets to a general formula for sample size.

A positive feature of the text, and one that in my view is appropriate for a first course to non-statistics majors, is that the authors approach a topic by describing the overall problem, and then cover the simplest aspect in detail. As an example consider their treatment of multiple comparison procedures in the chapter on one way ANOVA. They point out that when the ANOVA null hypothesis is rejected, additional tests are called for. They indicate that there are many techniques for conducting multiple comparisons and that the computation of multiple tests increases the probability of committing a Type I error. They then go on to explain the Bonferroni correction method in detail. No mention is made of Tukey's method or Scheffe's method, or any other method, and in my view, that is perfectly appropriate for this level.

Another example of this is in the chapter on nonparametric tests. The authors explain three nonparametric procedures: the sign test and the Wilcoxon signed-rank test - both for paired samples - and the rank sum test for two independent samples. For the rank sum test, they point out that if a large proportion of the observations are tied, then the standard deviations of the rank sums are overestimated. They then state: "To compensate for this, a correction term must be added to the calculations" -- and cite a reference. Apparently, the authors believe that this is enough for an introduction to the area of nonparametrics, for this level of student. I would agree.

It should be noted that the manner of applying the continuity correction for the normal approximation to the binomial distribution is incorrectly stated on page 295. The rule given there

3

is not consistent with the rules given by Bhattacharyya & Johnson (1977), pp. 208-204, or Rosner (1986), p. 116.

One change in the text that I would recommend, if the book has a second edition, is the inclusion of tables of binomial probabilities and Poisson probabilities. Although the binomial and Poisson distributions are discussed in this edition, the appropriate tables are surprisingly omitted. Thus for any problem involving either of these distributions, it is necessary to calculate probabilities from first principles. I found this to be awkward - giving rise to a great deal of hand computation that is unnecessary. One device I used to get around this problem was to show the class how to generate binomial and Poisson probabilities with the computer software they were using for the class. Nevertheless, if there were tables of binomial and Poisson probabilities provided in the text, it would be an improvement.

In sum, I recommend this book. For the intended audience the positive aspects far outweigh the negatives. I intend to use Principles of Biostatistics next time I teach the class.

References

Bhattacharyya, GK and Johnson, RA. Statistical Concepts and Methods. Wiley, 1977.

Rosner, B. Fundamentals of Biostatistics, 2nd edition. Duxbury Press, 1986.

*****

PRINTED WITH
SOY INK

Steven Verhulst
Southern Illinois University
School of Medicine
Statistics & Research Consulting
PO Box 19230
Springfield, Illinois 62794-9230

U.S. POSTAGE
0.24 8
SPRINGFIELD ILL
JUL 14 '94
PB METER
6016793

DR. STEPHEN LOONEY
DEPT OF FAMILY PRACTICE
UNIVERSITY OF LOUISVILLE - HSC
AMBULATORY CARE BUILDING
LOUISVILLE KY 40292-0001

TEACHING OF STATISTICS IN THE HEALTH SCIENCES