TEACHING OF STATISTICS IN THE HEALTH SCIENCES

Subsection of the Section on Statistical Education
American Statistical Association

March 1990

Editor's Notes

This will be the last Newsletter sent to those subscribers who have not paid since 1987. At present, the Newsletter will try to maintain the current year, as well as two previous years, as active subscribers. This time range just about catches most of the lags built into the system. If there are other suggestions, please let me know.

I would like to thank those individuals who have corresponded with the Newsletter over the last two years. I hope we can keep the cards and letters coming.

New Book for Past Editor

Lange medical books has just published a new book titled: Basic and Clinical Biostatistics by Beth Dawson-Saunders and Robert Trapp. For information, contact Appleton and Lange, 25 Van Zant Street, East Norwalk, Connecticut 06855. It looks like a good one!

Summer Symposium

The 9th Annual Workshop in Applied Statistics sponsored by the Southern California Chapter of the American Statistical Association will be held on May 18, 1990 at the University of Southern California. Professor Norman Breslow, Chairman of the Department of Biostatistics, University of Washington, will be speaking on the topic of The Analysis of Follow-Up Data: Poisson, Relative Risk and Conditional Logistic Regression. He will survey the following topics: Poisson regression analysis of grouped person-years data and SMR's, relative risk regression analysis of continuous epidemiologic data, and conditional logistic regression analysis of case-control samples. The common foundation of these three approaches will be emphasized. For more information, please contact R. Madison (818-885-4645 or 213-457-4627) or N. Berman (213-212-1874 or 213-476-2488).

Inquiries about:

Statistics in Psychology: An Historical Perspective can be addressed to Lawrence Erlbaum Associates, Inc., 365 Broadway, Hillsdale, New Jersey 07642.

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Teaching of Statistics in the Health Sciences is published three times a year at Southern Illinois University School of Medicine and entered as third class mail at Springfield, Illinois. It is mailed to all members of the ASA subsection on Teaching of Statistics in the Health Sciences. Changes of addresses or section membership should be sent to ASA, 1429 Duke Street, Alexandria, VA 22314.

This newsletter will publish official notices, articles, book reviews, descriptions of research in progress, reviews of research, letters, and announcements judged to be of interest to members of the subsection. Materials and manuscripts should be submitted to:

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A Review of Statistics in Psychology: An Historical Perspective

by
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Statistics in Psychology: An Historical Perspective by Michael Cowles is an excellent and well-written book which traces the evolution of statistics in psychology and the social sciences to the 1940s. Similar to other texts on the history of statistics, this one integrates research from a number of disparate fields (e.g., biology, mathematics, psychology, sociology) in a clear and readable fashion. To the author's credit, the focus of the book goes beyond that implied by the title and is relevant across most social science disciplines. The book is 218 pages in length; it contains 13 chapters, a subject index, and an author index. The book is both interesting and informative; I read the entire book in only four sessions. Equations and figures are numerous but space throughout the text so as not to be overly cumbersome.

Though there appear to be two target populations for this book, statistics students and statistics instructors, the courses for which this book is appropriate are not clearly evident. As a supplementary graduate text, I believe this book could be quite useful. However, I do not believe that it is written at a level that will be useful at the undergraduate level. The role of mathematics was minimized where possible, but not sufficiently for it to be easily readable by the average undergraduate social or health science major. Students in seminar or special topics classes may benefit from this text provided they have been exposed to and are accustomed to working with conceptual and applied statistical problems. The author's goal of making the material come alive appears to have been achieved through the use of a number of interesting and well-placed excerpts from original and secondary sources.

In Chapter 1, the author identifies topics (e.g., eugenics, normality, probability, regression) and people (e.g., Darwin, Fisher, Galton, Pearson) considered responsible for the evolution of statistics in psychology. The chapter concludes with a comment on the criticism faced by mathematicians as they began exploring problems in the social sciences and a comment on the general lack of awareness of today's researchers to the bases and limitations of many of our statistical procedures.

Chapter 2 begins with a discussion of determinism as the basis for our quests for causality and the resultant birth of experimental methods. Cowles uses the work of Greek and Judaic/Christian philosophers to lay the groundwork for later discussions of scientific responsibility and decision making. Gustav Fechner is identified as the first to introduce experimental methods to the field of psychology.

Chapter 3 shares much with many introductory statistics and measurement texts--perhaps too much. Topics such as respect for measurement, measurement scales, and error in measurement are discussed. Introduced but not discussed in sufficient detail is the relationship between statistical theory and measurement theory, a conceptual relationship that lies at the heart of many social science investigations. If "measurement bestows scientific respectability" (p. 32), as the author has implied, then one may wonder why the chapter accounted for only 10 pages of text.

In Chapter 4, political arithmetic, early vital-statistic studies, and graphical methods are all included under one title, "The Organization of Data." Transitions between these sections and logical links with the rest of the book were not readily apparent. Expanded notes on any one of the topics would have been appropriate.

Chapter 5 represents one of the most interesting and perhaps most useful chapters of the entire book. Entitled "Probability," this chapter moves from games of chance known to exist as early as 3,500 B.C. to the combinatorial analysis studies of the 20th century. The author associates rules of probability with concepts of normality and error estimation in a way that will likely be useful and easy to understand at an introductory level.

A relative weakness of the book becomes evident in Chapter 6. The binomial, Poisson, and normal distributions are presented mathematically and arranged chronologically, but without any real link between these important distributions and different methods of social or health science research.

In Chapter 7, "Practical Inference," the author begins with a discussion of Bayes' Theorem and concludes with a discussion of Fisherian inference. Introducing students to the origins of classical statistical inference may help to demystify the concept of hypothesis testing as well as sensitize them to the need for appropriate and logical hypotheses.

Randomness and estimation of error take center stage in Chapter 8. There seems to be very little in this chapter that cannot be found in existing texts on sampling or survey methods. This chapter may serve as a nice overview for those who have not had exposure to the aforementioned. The linear model is introduced for the first time, but only briefly, and as a means of incorporating the Principle of Least Squares with the normal law.

In Chapter 9, the evolution of X^2, t, and F distributions are considered, jointly and separately, an evolution that proved to be as interesting as it is historically relevant. E. L. Thorndike is cited as the first to apply Fisherian methods to psychological measures. Even the Central Limit Theorem is treated with more respect than in most introductory texts.

Historical aspects of co-relations and regression are presented in Chapter 10. Although this chapter tends to include more examples from biology and zoology than psychology, a major premise seems to be that techniques found useful in one field of study can be equally useful in another. One anecdote seems

particularly noteworthy; Pearson uncovered substantive errors in one of Galton's original analyses. The importance of ethical and accurate attention to detail by established as well as budding researchers is an unavoidably salient issue for any classroom discussion.

In Chapter 11, "The Design of Experiments," Cowles presents many historical issues surrounding experimental versus statistical control, issues that continue to surface today. An anticipated discussion of the general linear model alluded to earlier in the text filled no more than 1 1/2 pages. Readers may have benefitted from a more complete discussion of the relationship among the many parametric techniques.

Significance testing, confidence intervals, multiple comparisons, and one- versus two-tailed tests comprise Chapter 12. The chapter is conceptual but brings together essential and implicitly related concepts that the author believes are overlooked or missed altogether by many of today's researchers (e.g., a preoccupation with mean differences rather than variances in ANOVA studies).

In Chapter 13, "The Statistical Hotpot," the author introduces his readers to many of the ideological and even personal issues among the personalities who shaped this newly developing field, issues that go well beyond the methods and techniques used in statistical analyses.

In summary, I do not see this book as particularly useful at the undergraduate level; however, I do consider it to be a wonderful supplementary text for most graduate courses, applied as well as theoretical. The author presents a number of topics which are often glossed over in most statistics courses; it is nice to see them presented conceptually and organized historically in one text. Perhaps the most limiting factor of this book is in its title, Statistics in Psychology: An Historical Perspective. The interdisciplinary nature of this text makes it applicable across most social science disciplines.