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## Statistical Methods For Communication Science.

Andrew F. HAYES. Mahwah, NJ: Lawrence Erlbaum Associates, Inc., 2005,  
xviii + 517 pp., \$49.95 (H), ISBN: 0-8058-5487-8.

One of the most important responsibilities of statistics educators is the job of effectively communicating statistical concepts to students from outside of our discipline. Many textbooks have been written that tailor presentation to a specific audience. For example, students studying business, economics, psychology, and engineering frequently study introductory statistics using textbooks that use examples and case studies derived from their major field. However, until the publication of this text, students studying communication science did not have this same opportunity. (The author notes that his text is the first that focuses exclusively on statistical methodology in communication research.)

Before considering what *Statistical Methods for Communication Science* is, it is useful to note what it is not. It is not flashy. Increasingly, introductory texts are designed to be visually appealing. They include glossy pictures, multicolor charts, and specially highlighted information. This text does not. It is printed entirely in black and white. A purist might point out that this really does not affect the substance of the book. Certainly that is the case, but the presentation will tend to affect the extent to which students use the book. For this reason, I think the book is best suited to more mature audiences. From the preface, it appears this was the author's intent. He only discusses the book's use for a graduate-level research methods course.

One serious limitation of this book as a textbook, at any level, is the complete lack of homework problems. This is, perhaps, less of an issue in a graduate course. Nevertheless, any instructor adopting this textbook should expect to use other sources for crafting homework assignments.

The text is written in a clear, straightforward manner. Figures are included where necessary and important formulas and equations are boxed to call attention to them. The selection of topics is excellent. In addition to basic introductory probability and statistics, the book includes substantial discussions of categorical data analysis, regression (simple and multiple), and analysis of variance. I found the sections on analysis of covariance and on interaction particularly useful. Frequently, these important topics are buried within chapters on regression or completely left out.

Overall, as a reference text, I like this book a lot. It presents a wide range of important statistical topics in a no-nonsense, easy-to-follow format. Although it is not flashy, it contains a substantial amount of useful information. The book's contextual slant toward communication science is likely to benefit students in that area. Unfortunately, it is also likely to keep students in other areas from considering the book. This is a shame, because the book is an excellent reference text and would serve any applied researcher very well.

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## Multilevel and Longitudinal Modeling Using Stata.

Sophia RABE-HESKETH and Anders SKRONDAL. College Station, TX:  
Stata Press, 2005, xxiii + 317 pp., \$54.00 (P), ISBN: 1-59718-008-4.

The growth in use of multilevel regression modeling, where observations are repeated over time and/or clustered within some other hierarchy, has been well documented in many research settings. Although a number of readable texts on the theory underlying these methods have been published in recent years (e.g., Fitzmaurice, Laird, and Ware 2004; Diggle, Heagerty, Liang, and Zeger 2002; Singer and Willett 2003), there remains a need for companion texts that illustrate software implementations in real world applications. There have been extensive developments of clustered regression methods available within Stata, and the package now supports a rich set of procedures that rival support in SAS and R and exceed those in SPSS. A text that describes and illustrates these flexible regression models using Stata is useful and welcome.

While this book would not suffice as a standalone introduction to multilevel and longitudinal modeling, it complements those described above as well as

the authors' more advanced and more comprehensive companion text (Skrondal and Rabe-Hesketh 2004) in a helpful way. Detailed case studies with real-world datasets are accompanied by complete code to fit models, generate functions of parameters (e.g. odds ratio versus log odds ratio and associated confidence intervals), plots of predicted values and residual analysis. All too often computer manuals leave off these important aspects of an analysis, but the authors have been careful to provide a well-rounded and complete approach to model-fitting and interpretation. The examples are taken from a variety of research settings in the medical and social sciences. While Stata is easy to learn, some knowledge of the package is presumed, and features of version 9 (particularly the `xtmixed` command) are used.

Coverage includes the linear variance components model, the linear random-intercept model, linear random-coefficient and growth curve models, then proceeds to nonlinear generalizations of these models appropriate for dichotomous, ordinal, and count responses. The book concludes with chapters on higher level models, nested random effects, crossed random effects, and a series of appendixes describing the `gl11amm` (generalized linear latent and mixed models) software that the authors have created (which can be installed using a single three-word Stata command). While the `gl11amm` is used for some analyses, the book does not address the latent variable or structural equation models that are described in detail in Skrondal and Rabe-Hesketh (2004).

One strength of the text is its use of the same notation as in Skrondal and Rabe-Hesketh (2004). The authors also describe different notation in the Stata documentation (primarily the longitudinal/panel data manual, Stata Press 2005), which, while an excellent reference, is not designed for leisure reading.

Most chapters feature extended exposition of one of the example datasets. For example, Chapter 4's coverage of repeated dichotomous outcomes is illustrated with data from a randomized double-blind trial of two anti-fungal treatments of toenail infection, which involves 378 subjects followed through time for as many as seven measurement occasions. The authors carry out a series of analyses using these data, beginning with a generalized linear model framework (logistic and probit regression), then broaden their modeling to account for associations within cluster (in this case, subject). All of the necessary Stata code and output from these commands are provided. This includes commands to display the longitudinal structure, fit regression models, calculate odds ratios and log odds ratios (and associated confidence intervals), as well as to plot predicted probabilities of the outcome as a function of a dichotomous and a continuous predictor. The chapter also features discussions of the population averaged general estimating equation approach, random effects generalizations, and empirical Bayes predictions. It closes with comparisons of subject-specific and population-averaged approaches and a brief mention of conditional logistic regression.

These analyses are easy to follow, given Stata's elegant support for remote dataset access. Rather than having to access an ftp site or URL, users can load Chapter Four's dataset directly into the package with the following command:

```
use http://www.stata-press.com/data/mlmus/toenail
```

A strength of the book are the exercises at the end of each of the chapters. Chapter 4 concludes with more than seven pages of exercises that feature additional analyses of the toenail data as well as separate questions involving analysis of other datasets (all available online) and one hypothetical study concerning random intercept logistic models.

I envision regularly using this book in two ways. First, I will keep a copy on my shelf, along with the Stata's Longitudinal/Panel Data Reference Manual, to refresh my knowledge of the Stata syntax needed for analyses that I pursue. Second, I will ask my library to order a copy that could be used in conjunction with an introductory text by students or collaborators less familiar with these methods. The authors are to be commended for helping foster the appropriate use of these flexible regression models.

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