
Applied Longitudinal Analysis, based on the popular Harvard School of Public Health course of the same name, is a comprehensive and accessible treatment of modern statistical methods for analysis of longitudinal data. Renowned researchers in the field, the authors begin with the general linear model for correlated data, placing considerable emphasis on selection and evaluate of appropriate mean and covariance structures. The chapters on model comparison and evaluation are particularly useful for statisticians at all levels, and relevant issues such as testing of a null hypothesis on the boundary of the parameter space (e.g., that the variance of a random effect equals zero) are clearly and carefully described, with practical advice given. The authors provide comprehensive coverage of the linear mixed effects model (incidentally often called the Laird-Ware model, though the authors avoid this usage). Marginal models, including estimation using generalized estimating equations (GEE), and generalized linear mixed effects models are covered in detail. The second edition adds six new chapters with excellent coverage of methods for handling missing data and dropout (including multiple imputation and inverse probability weighting), sample size and power calculations, smoothing using penalized splines, time-varying covariates, and residual diagnostics. Case studies featuring important biomedical and public health applications accompany most chapters and are excellent illustrations of the methodology and the practical value of modern longitudinal data analysis methods.

The text is well-organized and clearly written. It is accessible to researchers with varying levels of statistical expertise, with plenty of data examples that make reading and learning enjoyable. I recommend it to biostatisticians as well as to clinicians and other health researchers who may not have much statistical training. The authors do not assume knowledge of calculus or matrix algebra and signpost the more technical sections, which may be omitted on first reading without loss of continuity.
Particularly notable is the authors’ emphasis on statistical practice and application of the methodology. Relevant SAS code is provided throughout the text with basic descriptions of each procedure presented. Stata and R code, along with over 30 real datasets used in the text and problem sets, are available on the authors’ websites. The book can either be read from cover to cover or kept as a reference text for specific analysis questions.

Though the authors place considerable emphasis on the practice of statistics, technical details are not ignored, and indeed I have used the first edition for many years in our doctoral-level course on longitudinal data analysis. While I do supplement with some more technical outside material, I’ve found the book’s combination of methodological detail and emphasis on applied statistics ideal for training biostatisticians for research and collaboration in a wide variety of settings. The authors’ keen intuition for modern longitudinal data permeates the text, making it an ideal resource for graduate students, self-taught researchers, or those simply looking for a refresher or reference text.

*Applied Longitudinal Analysis* is generally my first recommendation when asked for a valuable resource in the field due to the breadth of topics covered and its practical utility. Readers who do not have doctoral-level training in statistics, and even many who do, will find *Applied Longitudinal Analysis* more easily accessible than the classic *The Analysis of Longitudinal Data* by Diggle, Heagerty, Liang, and Zeger. Those with particular interest in Bayesian methods or multilevel modeling may prefer Gelman and Hill’s outstanding *Data Analysis Using Regression and Multilevel/Hierarchical Models*, though the latter text is not specifically focused on longitudinal data and does not cover GEE. While these and other excellent texts on longitudinal analysis also grace my bookshelves, to cover most of modern longitudinal analysis, a reader would need to purchase more than one of them. *Applied Longitudinal Analysis* provides excellent breadth and depth of coverage in a single text. For practicing statisticians, *Applied Longitudinal Analysis* will be the first place to turn for a sample size formula, code for a specific
analysis, or a refresher in a general topic area. I’ve taught from the first edition for seven years, and students always sing the praises of the text in the end-of-course evaluations.

If you own the first edition, should you invest in the second? I find the new chapters on missing data and sample size/power very useful. The discussion of inverse probability weighted GEE and provision of SAS programming code are particularly valuable contributions. I am also grateful for the new chapter on approximate methods of estimation in the generalized linear mixed effects model, which highlights critical computational issues that are often not recognized in practice. This is the type of book often “permanently borrowed” by students and colleagues, and my 5-6 copies of the first edition, purchased over the years, are now widely dispersed around the world. (Perhaps the authors should consider tracking devices in any potential 3rd edition, though broad dissemination of such a valuable resource is a desired outcome in some sense!) Don’t buy one – buy two: one to share, and one for you. Chances are you’ll be replenishing your supply by the next JSM.

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