Linear, logistic, and log-linear modeling are covered in Chapter 5, assuming simple random sampling and using the `survey` package in R (Lumley 2010). Chapter 6 discusses more complex issues related to modeling survey data, including coding variables, how to test categorical variables coded into multiple indicators, interaction terms, missing data, the bootstrap, and hierarchical modeling. The author continues his succinct style introducing topics, giving an application complete with R code and annotated examples.

Chapter 7 describes methods for deriving and validating a composite score derived from multiple survey questions, including factor analysis and Cronbach's alpha. Unfortunately, the author chooses to take a classical reliability approach to measurement theory. Adding a few pages discussing generalizability theory (G theory) would have been a good investment. Chapter 8 concludes the application of R to questionnaire analysis by discussing structural equation modeling. Finally, Chapter 9 provides an expansion of the discussion of manipulating data with R that began in Chapter 1. A quick reference-style appendix, a list of references, and an index are also included.

The author is to be congratulated for his compact and consistent writing style. The text, however, assumes a working knowledge of sampling theory and survey methodology that many practitioners may lack. It is also missing a number of important references, for example, to "classic" texts in survey methodology such as Kish (1995), Dillman, Smyth, and Christian (2009), and Thompson (2012). Even more surprising, despite using Lumley's R survey package, the author does not reference his text, *Complex Surveys: A Guide to Analysis Using R* (Lumley 2010).

Because of the omission of sampling theory and methodology, it would be difficult to use this book as an introductory text or as a primer on survey analysis. I mainly see the book as being useful for readers wishing to transfer knowledge of survey analysis and its application in other statistical packages to R. Insights in how a practitioner can use R to analyze one particular survey are very helpful and can be readily applied to one's own work.

I can see where this text would be handy to have on my bookshelf to refer to when conducting survey analyses. Taken in the proper context this is a good book to have and it is well worth its $98.95 price tag.

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Analyzing Wimbledon: The Power of Statistics.

Franc KLAASSEN and Jan R. MAGNUS. New York: Oxford University Press, 2014, xvi + 252 pp., $29.95(P), ISBN: 978-0-19-935596-9.

As an avid tennis fan for more than 20 years, I have always been intrigued with the role statistics can play in analyzing the outcome of a particular game, set, or even match. For example, when I watch Serena Williams, one of the best returners in the women's game, receive serve and if she manages to take the first two points of a game, I have often wondered how probable it is she wins that game. Similarly, when Roger Federer, arguably the greatest men's tennis player of all time, commits to serving and volleying behind a first serve, how likely does he win that point? Does Milos Raonic, one of the young rising stars in men's tennis who possesses a cannon for a serve, win the majority of his matches if his first serve percentage is above 60%?

The game of tennis is rich with descriptive statistics to help provide insight into answering such questions, but it is also plentiful with other commonly accepted views concerning a variety of aspects within the game—dare I say, the "finer points" of the game. I must admit that it is difficult to watch a tennis match on television without one of the commentators stating that serving first in a set is an advantage, or the top-ranked players in the world play the so-called "big points" better, or that it is more difficult for a player to hold serve when he/she is trying to consolidate a break. Such statements are uttered time and time again during telecasts, and I am sure that others besides me have wondered about their validity. More to the point, is there statistical evidence to back up these widely held beliefs?

Fortunately, for die-hard tennis aficionados such as myself, this comprehensive new book by Professors Franc Klaassen and Jan Magnus investigates such well-known theories and hypotheses surrounding the game of tennis (22 of them in fact, many of which tennis pundits hold very strong views) through statistical analysis of point-by-point data from approximately 500 Wimbledon matches over the period from 1992 to 1995. At its core, this book is a culmination of various academic articles the two Dutch authors have written since 1999 on the game of tennis. The statistical methods used throughout the book range from straightforward to advanced, only really requiring background in probability and statistics at the level of a third- or fourth-year undergraduate student in the North American college/university system.

Following Chapter 1 that provides a stimulating introduction and underscores the fact that scoring in tennis is almost objective (much more so than in other sports such as football or basketball, for instance), Chapters 2 through 4 describe the use of the authors' computer program *Richard* (aptly named after former Dutch Wimbledon champion Richard Krajicek) in forecasting the outcome of tennis matches as well as assessing the importance of certain points in a match. Central to their initial approach is the main assumption that winning a point on service follows an independent and identically distributed (iid) process. Few readers will believe this assumption actually holds true, and the authors do show later on in the book that this assumption is indeed false. However, what is remarkable though is not so much this conclusion (which is expected), but rather the fact that the deviation from iid is not as large as one would think. As a consequence, the statistical work the authors carry out here under the iid assumption serves as a credible approximation.

Realizing that a simple statistical analysis based on summary statistics like averages is not sufficient in making accurate conclusions on a number of often-espoused hypotheses, the authors make a strong case for the use of more sophisticated statistical techniques that call upon the theory of estimation, testing, and inference. As a result, Chapters 5 through 9 are much more methodological in nature, as several statistical models are introduced to more properly study a player's quality as well as the strategy and efficiency of the service component (since having two serves poses an interesting question as to whether a player is really as good as his/her second serve, so often heard in tennis circles). The authors employ a generalized method of moments estimation scheme, taking into account critical factors such as differences in the quality of the tennis players (which is cleverly handled through the formulation of a "pyramid-based" design connected to a player's world ranking), form of the day, and momentum in a match. These chapters, like much of the book, are full of interesting tables and figures to complement the statistical analysis and ensuing discussion.

Armed now with a more reliable statistical model, the authors in Chapters 10 through 12 revisit their earlier iid assumption and show that it is indeed the top-ranked players in the world who tend to play service points in an iid fashion, whereas weaker players deviate from iid in two fundamental ways: (i) their performance at the current point depends on what happened at the previous point, and (ii) they are also affected by the importance of the point (such as a break point). As the authors do throughout the book, they distinguish between men's tennis and women's tennis and, in some cases, discover that certain conclusions only apply to a particular gender. For example, there is statistical evidence to support a larger "discouragement effect" of missed break point opportunities in the women's game than in the men's game, meaning that the impact of a missed break point chance in the previous game tends to significantly affect the current game where the discouraged female receiver is now serving.

The authors sum things up nicely in Chapter 13, which provides an excellent account of earlier statistical findings by revisiting each of the 22 hypotheses one final time. The book also features three useful appendices. Appendix A gives a succinct summary of tennis rules and terminology that serves (no pun intended) to educate readers who are less familiar with the game of tennis. Appendix B contains a nice summary of the mathematical notation used for the numerous parameters and variables introduced in the book. For readers wanting a little more, Appendix C provides further details pertaining to the Wimbledon dataset used as well as the construction of the authors' computer program *Richard* (which can be downloaded from the authors' websites). The list of references on the game of tennis is also extensive, which makes the book a very useful reference for researchers interested in this area.

All in all, this book is an important contribution for statistical researchers who want to pursue their work in sports such as tennis. Even the mathematical statistician less familiar with the game of tennis will be fascinated by the wealth of ideas and techniques described in this book. Andre Agassi, American retired professional tennis player and former world number one, once described the game of tennis as boxing without the gloves. *Analyzing Wimbledon: The Power of Statistics* certainly pulls no punches and is a thoroughly enjoyable read that delivers on all counts.

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The A-Z Of Error-Free Research.

Phillip I. GOOD. Boca Raton, FL: CRC Press, 2013, xx + 249 pp., $52.95(P), ISBN: 978-1-4398-9737-9.

Presenting statistical concepts to a novice audience in a way that balances usefulness with comprehension while conveying the importance of the proper use of statistics is an ambitious and inherently difficult task. *The A-Z of Error Free Research* is the latest effort by author Phillip Good to provide some degree of statistical independence to the rookie researcher. In the same vein as his previous how-to guide, *Common Errors in Statistics (and How to Avoid Them)* (with co-author James Hardin), this text aims to provide a step-by-step guide to the design and analysis of clinical research studies, touching on topics as fundamental as variation and as complex as bootstrapping.

Though the title would suggest a thorough development of the topic, this text serves more as a primer on the fundamentals of research by presenting the pragmatic "10,000-foot view" of experimental design and analysis that an inexperienced researcher with some minimal training in statistics may find useful. Good has filled his primer with useful examples that include code in the R programming language, and has laced it with just enough humor to keep the reader engaged. However, at times the usefulness of the text is offset with an inappropriate level of mathematical detail that could potentially leave the reader confused.

The A-Z of Error Free Research is divided into four functional parts that span the planning, data collection, analysis, and reporting of clinical research experiments, and provides additional material on areas such as model building and observational studies. In the introductory chapters, Good emphasizes fundamental design concepts such as variation, representative samples, hypotheses, and the costs associated with decisions. In Chapter 4, he gives brief attention to designs ranging in complexity from a simple, completely randomized two-group design to an incomplete block design, along with the sage advice to keep it simple. Chapters 5 and 6 address outcome measures—what is a "good" response variable?—and data quality control. Data analysis is the focus of Chapters 7–11, which cover descriptive statistics, common inferential tests, multiplicity, and sample size estimation. The author also provides an exposure to topics not addressed in introductory level statistical methods courses such as the bootstrap, errors-in-variables regression, and principle component analysis. The latter chapters on reporting results, oral presentations, and graphics may be considered the most useful to the early-stage researcher, along with the "prescriptions" or recipes for the task at hand placed at the beginning of every chapter. Good closes each chapter with specific references to more in-depth development of topics for the motivated reader.

To maximize the impact of the text, a reader should have a background in research methods equivalent to an introductory graduate-level course in statistics. For those individuals, this text will help put theory into practice. The less-experienced researcher may find themselves confused and wanting for detail. Though the author provides an oversimplified view of topics such as survey development and elicitation of effect sizes and variance, at the very least he brings these and other important issues to the attention of the researcher and prepares them for eventual discussions with the statistician with which they should consult. An added note of caution should be given to the statistical novice—topics are not self-contained within the text. As a consequence, it should not be used as a cookbook for research, but should only be applied in practice after it is read from cover to cover. For instance, an example analysis using the Student's *t*-test is given early in the chapter on hypothesis testing, but the reader is not warned about assumption checking and issues with heteroscedasticity until the later chapter on miscellaneous hypothesis tests.

In summary, this primer on research design helps shed light on some of the fundamental issues in experimental design, analysis, and dissemination of results. Some of the most effective chapters are those regarding logistics and planning, how one should think about data and variation, how best to present results, and even how to respond to rejection. The author assumes some basic knowledge of mathematical statistics and the R programming language, and for the reader with a solid research methods background this primer will be a useful addition to their toolbox.

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Bayesian Methods in Epidemiology.

Lyle BROEMELING. Boca Raton, FL: Chapman and Hall/CRC, 2014, x + 454 pp., $89.95(H), ISBN: 978-1-466-56497-8.

In this book, Lyle Broemeling introduces Bayesian inference as it might be used in epidemiology. The aim is straightforward; by reading the book and working through the author's examples, and the examples at the end of each chapter, analysts working in epidemiology are supposed to gain an understanding of how Bayesian methods might be applied to their own work. The book has seven main chapters, each covering topics that should be familiar to epidemiologists with a statistical background at the level of, say, Clayton and Hills (1993).

The topics are describing associations, adjusting for covariates (directly and indirectly), life tables, survival analysis, and disease-screening. The final chapter dips more briefly into advanced topics, including spatial modeling. There is also an extensive introductory chapter describing the seven main chapters in some detail, and short appendices on the Bayesian calculus (i.e., updating priors with data to get posteriors) and on how to run Bayesian analyses in WinBUGS. The WinBUGS software is used throughout the book, with code and models available on the author's website. Given that Bayesian approaches are often an appealing and rational choice for epidemiologic work, educating practicing epidemiologists about Bayesian methods in this way seems a sensible goal. However, the book appears out-of-date in several ways, and so does not really achieve its goal.

Given its intended audience, my biggest concern is the book's portrayal of what epidemiologists do. For example, following the widespread adoption of the graphical formulation of causal inference (Greenland, Pearl, and Robins 1999) most epidemiologists today define a "confounder" as something more specific than the book's simplistic definition: a variable related to disease and risk factor. The same generation of epidemiologists would reject the book's repeated suggestion that they are only interested in association, rather than in the thoughtful consideration of what those associations mean. And as today's epidemiologists—like their statistical colleagues—are eager to embrace "Big Data" (Salathé et al. 2012; Khoury et al. 2013), it seems particularly jarring that every example dataset in the book *can be and is* presented within a few pages of typewriter-font text, as if in some pre-internet computing magazine.

Statistically, the book is also worryingly behind the times; for example, it has been known for several years that Gamma(0.001, 0.001) priors for precision parameters are a highly questionable default (Lambert et al. 2005; Browne et al. 2006; Gelman et al. 2006), yet they are ubiquitous here. The book's advice on MCMC seems at best quaint; there are no multiple chains nor even looks at the behavior of a single chain. Finally, the examples themselves appear in serious need of updating; the book's presentations consist of already well-worn examples from Clayton and Hills (1993), or Kahn and Sempos (1989), or the WinBUGS documentation (Lunn et al. 2000), without any obvious utility over the version in the source material. In addition to these serious problems, the book is poorly edited, does not provide a serious justification for using Bayesian methods instead of the more standard non-Bayesian ones, and includes some heavily mathematical exercises in an otherwise math-lite text.

It is difficult to recommend this book to those who want an introduction to Bayesian methods in epidemiology. For those who do, the texts by Woodworth (2004) and Lesaffre and Lawson (2012) are better places to start. For a more complete introduction to the WinBUGS software, see the BUGS book (Lunn