
Applied Missing Data Analysis

Statistical Analysis with Missing Data
 Missing Data Analysis in Practice
 Statistical Analysis with Missing Data
 Multiple Imputation and its Application
 Applied Missing Data Analysis in the Health Sciences
 Applied Categorical and Count Data Analysis
 Missing Data in Longitudinal Studies
 Flexible Imputation of Missing Data, Second Edition
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 Applied Categorical and Count Data Analysis
 Applied Functional Data Analysis
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VAUGHAN KARLEE

Statistical Analysis with Missing Data John Wiley & Sons

Sooner or later anyone who does statistical analysis runs into problems with missing data in which information for some variables is missing for some cases. Why is this a problem? Because most statistical methods presume that every case has information on all the variables to be included in the analysis. Using numerous examples and practical tips, this book offers a nontechnical explanation of the standard methods for missing data (such as listwise or casewise deletion) as well as two newer (and, better) methods, maximum likelihood and multiple imputation. Anyone who has been relying

on ad-hoc methods that are statistically inefficient or biased will find this book a welcome and accessible solution to their problems with handling missing data. *Missing Data Analysis in Practice* Elsevier
 Statistical power analysis has revolutionized the ways in which we conduct and evaluate research. Similar developments in the statistical analysis of incomplete (missing) data are gaining more widespread applications. This volume brings statistical power and incomplete data together under a common framework, in a way that is readily accessible to those with only an introductory familiarity with structural equation modeling. It answers many practical questions such as: How missing data affects the statistical power in a study How much power is likely with different amounts and types of missing

data How to increase the power of a design in the presence of missing data, and How to identify the most powerful design in the presence of missing data. Points of Reflection encourage readers to stop and test their understanding of the material. Try Me sections test one's ability to apply the material. Troubleshooting Tips help to prevent commonly encountered problems. Exercises reinforce content and Additional Readings provide sources for delving more deeply into selected topics. Numerous examples demonstrate the book's application to a variety of disciplines. Each issue is accompanied by its potential strengths and shortcomings and examples using a variety of software packages (SAS, SPSS, Stata, LISREL, AMOS, and MPlus). Syntax is provided using a single software program to promote continuity but in each case,

parallel syntax using the other packages is presented in appendixes. Routines, data sets, syntax files, and links to student versions of software packages are found at www.psypress.com/davey. The worked examples in Part 2 also provide results from a wider set of estimated models. These tables, and accompanying syntax, can be used to estimate statistical power or required sample size for similar problems under a wide range of conditions. Class-tested at Temple, Virginia Tech, and Miami University of Ohio, this brief text is an ideal supplement for graduate courses in applied statistics, statistics II, intermediate or advanced statistics, experimental design, structural equation modeling, power analysis, and research methods taught in departments of psychology, human development, education, sociology, nursing, social work, gerontology and other social and health sciences. The book's applied approach will also appeal to researchers in these areas. Sections covering Fundamentals, Applications, and Extensions are designed to take readers from first steps to mastery.

Statistical Analysis with Missing Data IAP
Missing data have long plagued those conducting applied research in the social, behavioral, and health sciences. Good missing data analysis solutions are available, but practical information about implementation of these solutions has been lacking. The objective of *Missing Data: Analysis and Design* is to enable investigators who are non-statisticians to implement modern missing data procedures properly in their research, and reap the benefits in terms of improved accuracy and statistical power. *Missing Data: Analysis and Design* contains essential information for both beginners and advanced readers. For researchers with limited missing data analysis experience, this book offers an easy-to-read introduction to the theoretical underpinnings of analysis of missing data; provides clear, step-by-step instructions for performing state-of-the-art multiple imputation analyses; and offers practical advice, based on over 20 years' experience, for avoiding and troubleshooting problems. For more advanced readers, unique discussions of attrition, non-Monte-Carlo techniques for simulations involving missing data, evaluation of the benefits of auxiliary variables, and highly cost-effective planned missing data designs are provided. The author lays out missing data theory in a plain English style that is accessible and precise. Most analysis described in the book are conducted using

the well-known statistical software packages SAS and SPSS, supplemented by Norm 2.03 and associated Java-based automation utilities. A related web site contains free downloads of the supplementary software, as well as sample empirical data sets and a variety of practical exercises described in the book to enhance and reinforce the reader's learning experience. *Missing Data: Analysis and Design* and its web site work together to enable beginners to gain confidence in their ability to conduct missing data analysis, and more advanced readers to expand their skill set.

Multiple Imputation and its Application
Cambridge University Press

* Emphasizes the latest trends in the field.
* Includes a new chapter on evolving methods. * Provides updated or revised material in most of the chapters.

Applied Missing Data Analysis in the Health Sciences Guilford Press

Now in its third edition, this classic book is widely considered the leading text on Bayesian methods, lauded for its accessible, practical approach to analyzing data and solving research problems.

Bayesian Data Analysis, Third Edition continues to take an applied approach to analysis using up-to-date Bayesian methods. The authors—all leaders in the statistics community—introduce basic concepts from a data-analytic perspective before presenting advanced methods. Throughout the text, numerous worked examples drawn from real applications and research emphasize the use of Bayesian inference in practice. New to the Third Edition Four new chapters on nonparametric modeling Coverage of weakly informative priors and boundary-avoiding priors Updated discussion of cross-validation and predictive information criteria Improved convergence monitoring and effective sample size calculations for iterative simulation Presentations of Hamiltonian Monte Carlo, variational Bayes, and expectation propagation New and revised software code The book can be used in three different ways. For undergraduate students, it introduces Bayesian inference starting from first principles. For graduate students, the text presents effective current approaches to Bayesian modeling and computation in statistics and related fields. For researchers, it provides an assortment of Bayesian methods in applied statistics. Additional materials, including data sets used in the examples, solutions to selected exercises, and software instructions, are available on the book's web page.

Applied Categorical and Count Data

Analysis John Wiley & Sons

Missing data pose challenges to real-life data analysis. Simple ad-hoc fixes, like deletion or mean imputation, only work under highly restrictive conditions, which are often not met in practice. Multiple imputation replaces each missing value by multiple plausible values. The variability between these replacements reflects our ignorance of the true (but missing) value. Each of the completed data set is then analyzed by standard methods, and the results are pooled to obtain unbiased estimates with correct confidence intervals. Multiple imputation is a general approach that also inspires novel solutions to old problems by reformulating the task at hand as a missing-data problem. This is the second edition of a popular book on multiple imputation, focused on explaining the application of methods through detailed worked examples using the MICE package as developed by the author. This new edition incorporates the recent developments in this fast-moving field. This class-tested book avoids mathematical and technical details as much as possible: formulas are accompanied by verbal statements that explain the formula in accessible terms. The book sharpens the reader's intuition on how to think about missing data, and provides all the tools needed to execute a well-grounded quantitative analysis in the presence of missing data.

Missing Data in Longitudinal Studies CRC Press

Sponsored by the American Educational Research Association's Special Interest Group for Educational Statisticians This volume is the second edition of Hancock and Mueller's highly-successful 2006 volume, with all of the original chapters updated as well as four new chapters. The second edition, like the first, is intended to serve as a didactically-oriented resource for graduate students and research professionals, covering a broad range of advanced topics often not discussed in introductory courses on structural equation modeling (SEM). Such topics are important in furthering the understanding of foundations and assumptions underlying SEM as well as in exploring SEM, as a potential tool to address new types of research questions that might not have arisen during a first course. Chapters focus on the clear explanation and application of topics, rather than on analytical derivations, and contain materials from popular SEM software.

Flexible Imputation of Missing Data, Second Edition Springer

This book, first published in 2007, is for the applied researcher performing data

analysis using linear and nonlinear regression and multilevel models. Flexible Imputation of Missing Data, Second Edition SAS Institute

The nonstatistician's quick reference to applied categorical data analysis With a succinct, unified approach to applied categorical data analysis and an emphasis on applications, this book is immensely useful to researchers and students in the biomedical disciplines and to anyone concerned with statistical analysis. This self-contained volume provides up-to-date coverage of all major methodologies in this area of applied statistics and acquaints the reader with statistical thinking as expressed through a variety of modern-day topics and techniques. Applied Categorical Data Analysis introduces a number of new research areas, including the Mantel-Haenszel method, Kappa statistics, ordinal risks, odds ratio estimates, goodness-of-fit, and various regression models for categorical data. Chap T. Le, author of Health and Numbers and Applied Survival Analysis, presents his information in a user-friendly format and an accessible style while purposefully keeping the mathematics to a level appropriate for students in applied fields. Well supplemented with helpful graphs and tables, Applied Categorical Data Analysis: * Covers both basic and advanced topics * Employs many real-life examples from biomedicine, epidemiology, and public health * Presents case studies in meticulous detail * Provides end-of-chapter exercise sets and solutions * Incorporates samples of computer programs (most notably in SAS). Applied Categorical Data Analysis is an important resource for graduate students and professionals who need a compact reference and guide to both the fundamentals and applications of the major methods in the field.

The Prevention and Treatment of Missing Data in Clinical Trials Guilford Press

Developed from the authors' graduate-level biostatistics course, Applied Categorical and Count Data Analysis, Second Edition explains how to perform the statistical analysis of discrete data, including categorical and count outcomes. The authors have been teaching categorical data analysis courses at the University of Rochester and Tulane University for more than a decade. This book embodies their decade-long experience and insight in teaching and applying statistical models for categorical and count data. The authors describe the basic ideas underlying each concept, model, and approach to give readers a

good grasp of the fundamentals of the methodology without relying on rigorous mathematical arguments. The second edition covers classic concepts and popular topics, such as contingency tables, logistic regression models, and Poisson regression models, along with modern areas that include models for zero-modified count outcomes, parametric and semiparametric longitudinal data analysis, reliability analysis, and methods for dealing with missing values. As in the first edition, R, SAS, SPSS, and Stata programming codes are provided for all the examples, enabling readers to immediately experiment with the data in the examples and even adapt or extend the codes to fit data from their own studies. Designed for a one-semester course for graduate and senior undergraduate students in biostatistics, this self-contained text is also suitable as a self-learning guide for biomedical and psychosocial researchers. It will help readers analyze data with discrete variables in a wide range of biomedical and psychosocial research fields. Features: Describes the basic ideas underlying each concept and model Includes R, SAS, SPSS and Stata programming codes for all the examples Features significantly expanded Chapters 4, 5, and 8 (Chapters 4-6, and 9 in the second edition Expands discussion for subtle issues in longitudinal and clustered data analysis such as time varying covariates and comparison of generalized linear mixed-effect models with GEE

Statistical Analysis With Missing Data CRC Press

This book presents the statistical analysis of compositional data using the log-ratio approach. It includes a wide range of classical and robust statistical methods adapted for compositional data analysis, such as supervised and unsupervised methods like PCA, correlation analysis, classification and regression. In addition, it considers special data structures like high-dimensional compositions and compositional tables. The methodology introduced is also frequently compared to methods which ignore the specific nature of compositional data. It focuses on practical aspects of compositional data analysis rather than on detailed theoretical derivations, thus issues like graphical visualization and preprocessing (treatment of missing values, zeros, outliers and similar artifacts) form an important part of the book. Since it is primarily intended for researchers and students from applied fields like geochemistry, chemometrics, biology and natural sciences, economics, and social

sciences, all the proposed methods are accompanied by worked-out examples in R using the package robCompositions.

Missing Data CRC Press

Missing data affect nearly every discipline by complicating the statistical analysis of collected data. But since the 1990s, there have been important developments in the statistical methodology for handling missing data. Written by renowned statisticians in this area, Handbook of Missing Data Methodology presents many methodological advances and the latest applications of missing data methods in empirical research. Divided into six parts, the handbook begins by establishing notation and terminology. It reviews the general taxonomy of missing data mechanisms and their implications for analysis and offers a historical perspective on early methods for handling missing data. The following three parts cover various inference paradigms when data are missing, including likelihood and Bayesian methods; semi-parametric methods, with particular emphasis on inverse probability weighting; and multiple imputation methods. The next part of the book focuses on a range of approaches that assess the sensitivity of inferences to alternative, routinely non-verifiable assumptions about the missing data process. The final part discusses special topics, such as missing data in clinical trials and sample surveys as well as approaches to model diagnostics in the missing data setting. In each part, an introduction provides useful background material and an overview to set the stage for subsequent chapters. Covering both established and emerging methodologies for missing data, this book sets the scene for future research. It provides the framework for readers to delve into research and practical applications of missing data methods.

Analysis of Incomplete Multivariate Data John Wiley & Sons

The last two decades have seen enormous developments in statistical methods for incomplete data. The EM algorithm and its extensions, multiple imputation, and Markov Chain Monte Carlo provide a set of flexible and reliable tools from inference in large classes of missing-data problems. Yet, in practical terms, those developments have had surprisingly little impact on the way most data analysts handle missing values on a routine basis. Analysis of Incomplete Multivariate Data helps bridge the gap between theory and practice, making these missing-data tools accessible to a broad audience. It presents a unified, Bayesian approach to the analysis of incomplete multivariate data,

covering datasets in which the variables are continuous, categorical, or both. The focus is applied, where necessary, to help readers thoroughly understand the statistical properties of those methods, and the behavior of the accompanying algorithms. All techniques are illustrated with real data examples, with extended discussion and practical advice. All of the algorithms described in this book have been implemented by the author for general use in the statistical languages S and S Plus. The software is available free of charge on the Internet.

Applied Compositional Data Analysis
CRC Press

This book summarizes current knowledge regarding the theory of estimation for semiparametric models with missing data, in an organized and comprehensive manner. It starts with the study of semiparametric methods when there are no missing data. The description of the theory of estimation for semiparametric models is both rigorous and intuitive, relying on geometric ideas to reinforce the intuition and understanding of the theory. These methods are then applied to problems with missing, censored, and coarsened data with the goal of deriving estimators that are as robust and efficient as possible.

Multiple Imputation of Missing Data in Practice CRC Press

This book brings together a collection of articles on statistical methods relating to missing data analysis, including multiple imputation, propensity scores, instrumental variables, and Bayesian inference. Covering new research topics and real-world examples which do not feature in many standard texts. The book is dedicated to Professor Don Rubin (Harvard). Don Rubin has made fundamental contributions to the study of missing data. Key features of the book include: Comprehensive coverage of an important area for both research and applications. Adopts a pragmatic approach to describing a wide range of intermediate and advanced statistical techniques. Covers key topics such as multiple imputation, propensity scores, instrumental variables and Bayesian inference. Includes a number of applications from the social and health sciences. Edited and authored by highly respected researchers in the area.

Missing Data Routledge

Drawing from the authors' own work and from the most recent developments in the field, *Missing Data in Longitudinal Studies: Strategies for Bayesian Modeling and Sensitivity Analysis* describes a comprehensive Bayesian approach for

drawing inference from incomplete data in longitudinal studies. To illustrate these methods, the authors employ several data sets throughout that cover a range of study designs, variable types, and missing data issues. The book first reviews modern approaches to formulate and interpret regression models for longitudinal data. It then discusses key ideas in Bayesian inference, including specifying prior distributions, computing posterior distribution, and assessing model fit. The book carefully describes the assumptions needed to make inferences about a full-data distribution from incompletely observed data. For settings with ignorable dropout, it emphasizes the importance of covariance models for inference about the mean while for nonignorable dropout, the book studies a variety of models in detail. It concludes with three case studies that highlight important features of the Bayesian approach for handling nonignorable missingness. With suggestions for further reading at the end of most chapters as well as many applications to the health sciences, this resource offers a unified Bayesian approach to handle missing data in longitudinal studies.

Applied Survey Data Analysis Cambridge University Press

Walking readers step by step through complex concepts, this book translates missing data techniques into something that applied researchers and graduate students can understand and utilize in their own research. Enders explains the rationale and procedural details for maximum likelihood estimation, Bayesian estimation, multiple imputation, and models for handling missing not at random (MNAR) data. Easy-to-follow examples and small simulated data sets illustrate the techniques and clarify the underlying principles. The companion website includes data files and syntax for the examples in the book as well as up-to-date information on software. The book is accessible to substantive researchers while providing a level of detail that will satisfy quantitative specialists. This book will appeal to researchers and graduate students in psychology, education, management, family studies, public health, sociology, and political science. It will also serve as a supplemental text for doctoral-level courses or seminars in advanced quantitative methods, survey analysis, longitudinal data analysis, and multilevel modeling, and as a primary text for doctoral-level courses or seminars in missing data.

Applied Longitudinal Data Analysis for Epidemiology CRC Press

This book discusses the most important techniques available for longitudinal data analysis, from simple techniques such as the paired t-test and summary statistics, to more sophisticated ones such as generalized estimating of equations and mixed model analysis. A distinction is made between longitudinal analysis with continuous, dichotomous and categorical outcome variables. The emphasis of the discussion lies in the interpretation and comparison of the results of the different techniques. The second edition includes new chapters on the role of the time variable and presents new features of longitudinal data analysis. Explanations have been clarified where necessary and several chapters have been completely rewritten. The analysis of data from experimental studies and the problem of missing data in longitudinal studies are discussed. Finally, an extensive overview and comparison of different software packages is provided. This practical guide is essential for non-statisticians and researchers working with longitudinal data from epidemiological and clinical studies. *Applied Longitudinal Analysis* John Wiley & Sons

This book trains the next generation of scientists representing different disciplines to leverage the data generated during routine patient care. It formulates a more complete lexicon of evidence-based recommendations and support shared, ethical decision making by doctors with their patients. Diagnostic and therapeutic technologies continue to evolve rapidly, and both individual practitioners and clinical teams face increasingly complex ethical decisions. Unfortunately, the current state of medical knowledge does not provide the guidance to make the majority of clinical decisions on the basis of evidence. The present research infrastructure is inefficient and frequently produces unreliable results that cannot be replicated. Even randomized controlled trials (RCTs), the traditional gold standards of the research reliability hierarchy, are not without limitations. They can be costly, labor intensive, and slow, and can return results that are seldom generalizable to every patient population. Furthermore, many pertinent but unresolved clinical and medical systems issues do not seem to have attracted the interest of the research enterprise, which has come to focus instead on cellular and molecular investigations and single-agent (e.g., a drug or device) effects. For clinicians, the end result is a bit of a "data desert" when it comes to making decisions. The new research infrastructure proposed in this book will help the medical profession to

make ethically sound and well informed decisions for their patients.

[Applied Longitudinal Data Analysis for Epidemiology](#) CRC Press

Developed from the authors' graduate-level biostatistics course, *Applied Categorical and Count Data Analysis, Second Edition* explains how to perform the statistical analysis of discrete data, including categorical and count outcomes. The authors have been teaching categorical data analysis courses at the University of Rochester and Tulane University for more than a decade. This book embodies their decade-long experience and insight in teaching and applying statistical models for categorical and count data. The authors describe the basic ideas underlying each concept,

model, and approach to give readers a good grasp of the fundamentals of the methodology without relying on rigorous mathematical arguments. The second edition covers classic concepts and popular topics, such as contingency tables, logistic regression models, and Poisson regression models, along with modern areas that include models for zero-modified count outcomes, parametric and semiparametric longitudinal data analysis, reliability analysis, and methods for dealing with missing values. As in the first edition, R, SAS, SPSS, and Stata programming codes are provided for all the examples, enabling readers to immediately experiment with the data in the examples and even adapt or extend the codes to fit data from their own studies. Designed for a one-semester

course for graduate and senior undergraduate students in biostatistics, this self-contained text is also suitable as a self-learning guide for biomedical and psychosocial researchers. It will help readers analyze data with discrete variables in a wide range of biomedical and psychosocial research fields. Features: Describes the basic ideas underlying each concept and model Includes R, SAS, SPSS and Stata programming codes for all the examples Features significantly expanded Chapters 4, 5, and 8 (Chapters 4-6, and 9 in the second edition Expands discussion for subtle issues in longitudinal and clustered data analysis such as time varying covariates and comparison of generalized linear mixed-effect models with GEE

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