

1. Record Nr.	UNINA9910464489103321
Titolo	Applied missing data analysis in the health sciences / / Xiao-Hua Zhou [and three others]
Pubbl/distr/stampa	Hoboken, New Jersey : , : John Wiley & Sons, , 2014 ©2014
ISBN	1-118-57363-3
Descrizione fisica	1 online resource (254 p.)
Collana	Wiley Series in Statistics in Practice
Disciplina	610.711
Soggetti	Medical sciences - Study and teaching Medicine - Research Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Applied Missing Data Analysis in the Health Sciences; Contents; List of Figures; List of Tables; Preface; 1 Missing Data Concepts and Motivating Examples; 1.1 Overview of the Missing Data Problem; 1.2 Patterns and Mechanisms of Missing Data; 1.2.1 Missing Data Patterns; 1.2.2 Missing Data Mechanisms; 1.3 Data Examples; 1.3.1 Improving Mood and Promoting Access to Collaborative Treatment (IMPACT) Study; 1.3.2 National Alzheimer's Coordinating Center Minimum DataSet; 1.3.3 National Alzheimer's Coordinating Center Uniform DataSet; 1.3.4 The Pathways Study 1.3.5 Randomized Trial on Vitamin A Supplement 1.3.6 Randomized Trial on Effectiveness of Flu Shot; 2 Overview of Methods for Dealing with Missing Data; 2.1 Methods That Remove Observations; 2.1.1 Complete-Case Methods; 2.1.2 Weighted Complete-Case Methods; 2.1.3 Removing Variables with Large Amounts of Missing Values; 2.2 Methods That Utilize All Available Data; 2.2.1 Maximum Likelihood; 2.3 Methods That Impute Missing Values; 2.3.1 Single Imputation Methods; 2.3.2 Multiple Imputation; 2.4 Bayesian Methods; 3 Design Considerations in the Presence of Missing Data 3.1 Design Factors Related to Missing Data 3.2 Strategies for Limiting Missing Data in the Design of Clinical Trials; 3.3 Strategies for Limiting Missing Data in the Conduct of Clinical Trials; 3.4 Minimize the Impact

of Missing Data; 4 Cross-Sectional Data Methods; 4.1 Overview of General Methods; 4.2 Data Examples; 4.2.1 Simulation Study; 4.2.2 NHANES Example; 4.3 Maximum Likelihood Approach; 4.3.1 EM Algorithm for Linear Regression with a Missing Continuous Covariate; 4.3.2 EM Algorithm for Linear Regression with Missing Discrete Covariate  
4.3.3 EM Algorithm for Logistic Regression with Missing Binary Outcome  
4.3.4 Simulation Study; 4.3.5 IMPACT Study; 4.3.6 NACC Study; 4.4 Bayesian Methods; 4.4.1 Theory; 4.4.2 Joint Model and Ignorable Missingness; 4.4.3 Bayesian Computation for Missing Data; 4.4.4 Simulation Example; 4.4.5 IMPACT Study; 4.4.6 NHANES Example; 4.5 Multiple Imputation; 4.5.1 Theory; 4.5.2 Some General Guidelines on Imputation Models and Analysis Models; 4.5.3 Theoretical Justification for the MI Method; 4.5.4 MI When  $\mathbf{Y}$  Is -Dimensional; 4.5.5 Simulated Example; 4.5.6 IMPACT Study  
4.6 Imputing Estimating Equations  
4.7 Inverse Probability Weighting; 4.7.1 Theory; 4.7.2 Simulated Example; 4.8 Doubly Robust Estimators; 4.8.1 Theory; 4.8.2 Variance Estimation; 4.8.3 NACC Study; 4.9 Code Used in This Chapter; 4.9.1 Code Used in Section 4.3.4; 4.9.2 Code Used in Section 4.3.5; 4.9.3 Code Used in Section 4.4.4; 4.9.4 Code Used in Section 4.4.5; 4.9.5 Code Used in Section 4.4.6; 4.9.6 Code Used in Section 4.5.5; 4.9.7 Code Used in Section 4.5.6; 4.9.8 Code Used in Section 4.7.2; 5 Longitudinal Data Methods; 5.1 Overview; 5.2 Examples; 5.2.1 IMPACT Study; 5.2.2 NACC UDS Data  
5.3 Longitudinal Regression Models for Complete Data

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## Sommario/riassunto

A modern and practical guide to the essential concepts and ideas for analyzing data with missing observations in the field of biostatistics. With an emphasis on hands-on applications, *Applied Missing Data Analysis in the Health Sciences* outlines the various modern statistical methods for the analysis of missing data. The authors acknowledge the limitations of established techniques and provide newly-developed methods with concrete applications in areas such as causal inference methods and the field of diagnostic medicine. Organized by types of data, chapter coverage

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