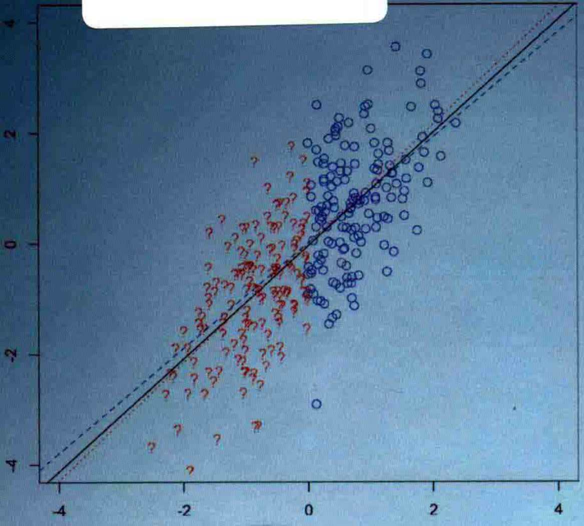
Applied Missing Data Analysis in the Health Sciences



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APPLIED MISSING DATA ANALYSIS IN HEALTH SCIENCES

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To Yea-Jae, Yi,
Tingting, and Shuqin

PREFACE

With a strong practical emphasis on health science applications, this book describes statistical methods and models for the analysis of data with missing values. We attempt to write so that researchers with experience in applied data analysis, but less technical knowledge than a statistician, should be able to understand and implement most of the methods described. For those with a stronger background in statistics, we provide more technical details as to not detract from the flow of rest of the chapter. We have also tried to choose examples that are relevant to most health science researchers who work in a variety of disciplines.

In all fields of study, missing data are a common problem since, for any data collection process, there are so many things that could go wrong that missing values are all too likely. Thus, when attempts are made to answer the scientific questions of interest, researchers ask the all-too-common question: what do we do with the missing data?

The statistical literature to answer this question is well developed, but overly technical and complicated for researchers who are not experts in statistics and methodology. Therefore, researchers may recognize the existence of missing data, but fail to respond for two reasons: first, they may not understand the consequences of ignoring missing data and how it can impact the validity of their results; second, there is a lack of understanding of the statistical methods for missing data and how to apply them in their own research. Therefore, the purpose of this book is to provide health science researchers with the means of understanding the importance of missing data in their own personal research and the ability to use these methods given the available software.

This book is organized into eight chapters. Chapter 1 introduces concepts on the missing data mechanism and some real-world examples. Chapter 2 gives an overview of methods for dealing with missing data. Chapter 3 describes some design strategies for minimizing the impact of missing data. Chapters 4 and 5 introduce methods for dealing with missing data problems in cross-sectional and longitudinal studies, respectively. Chapter 6 deals exclusively with missing data problems in survival analysis. Whereas Chapters 3–6 deal with ignorable missing data problems, Chapter 7 presents methods for dealing with nonignorable missing data problems. Finally, Chapter 8 discusses methods for dealing with missing data in causal inferences.

As we worked through examples in the book, we chose to provide software code in the text of the chapters as we want to encourage application of these methods after an understanding of the basic theory. We chose to include R code in the text as many of the methods can be implemented in R; in addition, R is also a publicly available software environment (see www.r-project.org). Since many researchers also use Stata in addition to R, we include code for some selected examples. All the analysis data sets, together with R and Stata codes used in this book, can be downloaded from http://faculty.washington.edu/azhou/.

X.H. ZHOU, C. ZHOU, D. LIU, AND X. DING

Seattle, Washington
March, 2014

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