

PREFACE

Since the early last century, many scholars from China have studied statistics in Western countries. Some of the early pioneers, including P.L. Hsu, C.L. Chiang, C.C. Lee, K.L. Chung, and G. Tiao, etc., achieved international recognition for their significant contributions to advanced statistics. Since the 1960s, many students from Taiwan, Hong Kong, and Mainland China have received their advanced degrees from universities in North America and Europe. Some have remained, becoming professors in academia or scientists in government or industry and making significant contributions to the fields of statistics and biostatistics. Many have been elected as fellows of the American Statistical Association and/or senior members of International Biometric Society. Others have become editors or associate editors for important journals, including the *Annals of Statistics*, the *Annals of Probability*, the *Journals of the Royal Statistical Society*, the *Journal of American Statistical Association*, *Biometrika*, *Biometrics*, and *Statistica Sinica*, etc. Several Chinese statisticians have been honored with the COPSS award, among whom Professor T.L. Lai and J. Fan have participated in the creation of this book. Meanwhile, many young statisticians have trained in Mainland China. They have accumulated a rich store of experience in teaching biostatistics and applying its theory and methods to medical research in their home country. Many overseas Chinese statisticians as well as statisticians in Mainland China, Taiwan and Hong Kong participated in publishing a book in Chinese about advances in medical statistics, which was published in 2000 by The People's Health Press, Beijing. Now, with the help of World Scientific Publishing Co, we are pleased to present the English version of this book — “*Advanced Medical Statistics*” — with a much larger professional community of English readers.

The book consists of four sections and 29 chapters. The first section is about statistical methods in biomedical research, including their history and statistical thinking in medical research, medical diagnoses, dependent

data, quality control and quality assurance in medical measurements, cost-effective and evidence-based medicine, quality of life, meta analysis, descriptive statistics, medical image processing, and time series. Many of these statistical methods were developed specifically for specific medical issues. The second section covers the most important statistical issues in pharmaceutical research and development, including pharmacology and pre-clinical studies, biopharmaceutical research, toxicological study, and confirmative clinical trials. Some of the theory and methods are published here for the first time. The third section is concerned with statistical methods in epidemiology, including statistics in genetic studies, risk assessment, infectious diseases, disease surveys, capture-recapture models for monitoring epidemics, cancer screening, and causal inferences. Most of the methods have been newly developed within the past decades. The last section is dedicated to advanced statistical theory and methods, including survival analysis, longitudinal data analysis, non-parametric curve estimation, Bayes statistics, stochastic processes, tree structured methods, EM algorithms, and artificial neural networks. These last chapters not only summarize the current status of research, future research topics and applications in medical research, but also provide some necessary theory and background for the statistical methods discussed in the first three sections.

All the chapters in the book are independent of each other; each is dedicated to a specific issue. To meet the needs of different readers, all chapters have a similar structure. The first subsection introduces the general concepts and the medical questions discussed in the chapter; examples are usually given in this section. The following sections present more specific details of concepts, methods and algorithms with the emphasis on application and significance. Derivations of proofs are generally not included, but citations in the literature are provided for interested readers.

This book is targeted to a broad readership. We hope that regardless of your background whether as a physician, a researcher in bioscience, a professional statistician, or a graduate student, you will find the book appropriate to your needs. As statistical thinking and methods are essential tools in modern medicine and biomedical research, medical researchers, leaving aside the statistical derivations and mathematical arguments, will learn what statistical tools are available to them, how to prepare the necessary information to use these methods, and how to interpret statistical results and their limitations. For professional medical statisticians, this book provides a broad perspective on medical statistics, their possible applications and interactions between special subjects, and suggestions

about future research topics, which will be helpful to their research as well as in consultation work with clients. For theoretical statisticians or applied statisticians working in other areas, the book provides many examples of statistical applications and challenges facing medical statistics, and which should help theoretical statisticians to identify new frontiers and possible application areas of their new methods. Last but not least, this book is a good reference for graduate students, providing a broad overview of medical statistics that will help them to select their research topics and guide them into the heart of the issue.

All the authors are experts in their specific areas. Each chapter reflects their own research experience, results and achievements. They have given much under the tremendous pressures of their many other obligations. As editors, we greatly appreciate their support, dedications and friendship.

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