

# Preface

This book is a result of many years of teaching introductory statistical theory at the Johns Hopkins University Department of Biostatistics. It is designed for advanced undergraduates or master's level students.

The approach used is to introduce students to statistical theory without the use of too many advanced mathematical concepts which often inhibit the understanding of the basic philosophical foundations of statistics. In particular, attention is paid to the continuing debate on the foundations of statistics and the reasons why statistics “works” using any one of the major philosophical approaches to the subject. Most standard texts pay little or no attention to the contrasts between schools of statistical thought and how they related to each other. In particular I emphasize the Law of Likelihood as a way to connect various approaches.

Students must be made aware of the fact that there are no agreed upon methods for solving all of the problems to which modern statistics is asked to find solutions. I suspect that many of the current ad hoc procedures currently used will continue to be used for decades to come. A student can, however, be equipped at a modest level of mathematics with tools necessary to understand the myriad of statistical methods now available. The explosion of statistical packages in the last twenty years makes it possible for almost any one to perform analyses deemed intractable just a few years ago. This book is about some of the basic principles of statistics needed to criticize and understand the methods for analyzing complex data sets. I have included a short chapter on finite population sampling since I believe that every statistician should have some knowledge of the subject and since it forms the basis for much of what we know about contemporary society. It also clearly illustrates the need for some understanding of the foundations of statistics. I also included a section in the appendix on interpretations of probability, a subject which is often omitted in statistics texts. The remainder of the appendix consists of material on probability and some mathematical concepts which I find convenient to have in one place for reference.

A word on regularity conditions is in order. It often happens that a result is true provided some conditions are assumed. These are called **regularity conditions**.

In this book I am cavalier about these since being precise provides an additional layer of mathematics and often obscures the statistical concepts. In many cases it is easier to prove results from scratch rather than verify a list of regularity conditions.

I have tried to cite references for the many examples in the text. Unfortunately, as is often the case when lecture notes are developed into a book, some sources have been forgotten. I apologize in advance for these omissions and will correct them on the website as I become aware of them. The text is deliberately thin on exercises. Many more (with solutions) will appear on the website.

I thank the many students who have suffered through versions of these notes. I thank Richard Royall for many discussions and advice on statistics in general and likelihood in particular. Finally, I thank my wife, Savilla, for putting up with me.

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