Statistics Explained

Statistics Explained is a reader-friendly introduction to experimental design and statistics for undergraduate students in the life sciences, particularly those who do not have a strong mathematical background. Hypothesis testing and experimental design are discussed first. Statistical tests are then explained using pictorial examples and a minimum of formulae. This class-tested approach, along with a well-structured set of diagnostic tables, will give students the confidence to choose an appropriate test with which to analyse their own data sets. Presented in a lively and straightforward manner *Statistics Explained* will give readers the depth and background necessary to proceed to more advanced texts and applications. It will therefore be essential reading for all bioscience undergraduates, and will serve as a useful refresher course for more advanced students.

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An Introductory Guide for Life Scientists

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Preface

If you mention 'statistics' or 'biostatistics' to life scientists, they often look nervous. Many fear or dislike mathematics, but an understanding of statistics and experimental design is essential for graduates, postgraduates, and researchers in the biological, biochemical, health, and human movement sciences.

Since this understanding is so important, life science students are usually made to take some compulsory undergraduate statistics courses. Nevertheless, I found that a lot of graduates (and postgraduates) were unsure about designing experiments and had difficulty knowing which statistical test to use (and which ones not to!) when analysing their results. Some even told me they had found statistics courses 'boring, irrelevant and hard to understand'.

It seemed there was a problem with the way many introductory biostatistics courses were presented, which was making students disinterested and preventing them from understanding the concepts needed to progress to higher-level courses and more complex statistical applications. There seemed to be two major reasons for this problem, and as a student I encountered both.

First, a lot of statistics textbooks take a mathematical approach and often launch into considerable detail and pages of daunting looking formulae without any straightforward explanation about what statistical testing really does.

Second, introductory biostatistics courses are often taught in a way that does not cater for life science students who may lack a strong mathematical background.

When I started teaching at Central Queensland University I thought there had to be a better way of introducing essential concepts of

biostatistics and experimental design. It had to start from first principles and develop an understanding that could be applied to all statistical tests. It had to demystify what these tests actually did and explain them with a minimum of formulae and terminology. It had to relate statistical concepts to experimental design. And, finally, it had to build a strong understanding to help the student progress to more complex material. I tried this approach with my undergraduate classes and the response from a lot of students, including some postgraduates who sat in on the course, was, 'Hey Steve, you should write an introductory stats book!'

Ward Cooper suggested I submit a proposal for this sort of book to Cambridge University Press. Ruth McKillup read, commented on, and reread several drafts, provided constant encouragement, and tolerated my absent mindedness. My students, especially Steve Dunbar, Kevin Strychar, and Glenn Druery, encouraged me to start writing and my friends and colleagues, especially Dearne Mayer and Sandy Dalton, encouraged me to finish. Finally, I sincerely thank the anonymous reviewers of the initial proposal and the subsequent manuscript who, without exception, made most appropriate suggestions for improvement.