BOOK REVIEW Maarten Boers (2022) Data Visualization for Biomedical Scientists: Creating Tables and Graphs That Work

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A few years ago, as a PhD student at the Vrije University Medical Center in Amsterdam, I attended a workshop led by Maarten Boers on the topic of his latest publication: Data visualization for Biomedical Scientists - Creating Tables and Graphs That Work. After working through some examples, we worked on our own tables and figures using Prism (a software for graphing that was available at my institution). The most important point I took away was that the tables and graphs I was creating, up to that point, were perhaps adequate but they could be improved substantially. I have been on the hunt since for materials that expand on this topic, to improve my own work and to be able to better mentor students. I was delighted to find out that Boers created a guide using a hands-on, step-by-step approach for visualization of data in the biomedical sciences. Professor Boers has recently retired after an illustrious career in clinical epidemiology. What I understood from the workshop is that he has spent the last part of his career in thinking about and improving the visualization of data, therefore this book is a culmination of years of working on this task and it hits the mark.

This book is succinct given the large amount of ground covered. The book is accompanied by online material (files, videos) that further illustrate approaches, processes, and examples. After a brief introduction, chapter 2 focuses on tables. To some of us designing tables containing results might be intuitive by now, would we even need a chapter on this? However, are students and researchers given guidelines on how to design good tables and figures in the first place? The deepness of the materials indicates that creating tables is a skill that one could work on. Boers discusses layout, how to optimize it to create groupings and direct the reader to the main message of the table. This is crafted, among others, by making use of white space, including how to manipulate row height in Excel or in Word in a strategic way. Chapters 3 and 4 are dedicated to graphs. Chapter 3 presents an overview of the main graph types and their purpose. The 'construction of graphs' section takes the reader through everything: how to determine a clear understanding of what the graph must convey, placing information that is considered non-data ink (everything on the graph except data) and maximizing and optimize data ink. Some space is dedicated to explaining

why some graph types should not be used. It is a fun and informative section. Overlaying of plots and summary data and improving forests plots are also covered in-depth. The chapter on matrix graphs covers a difficult topic with ease. A complex matrix graph is presented, each mini graph is investigated, and improvements generated. Every element of design is considered and the re-worked graph is presented and discussed. The dense biomedical data used in this example might be at first a bit confusing for scientists working in other fields, but anyone working with data would be able to work through it. Lastly, the chapter on 'publishing and presenting' offers insight into making the process of manuscript submission easier. It is good insight that might save hours of tedious work. Coming full circle, Boers ends with guidelines for tables used in oral presentations and poster presentations. I think this information is useful for researchers at various levels and applicable across disciplines that analyse and interpret data.

One of the many strengths of this book is the availability of the Prism files used to create the figures presented and discussed. This is part of the book's practical, step-by-step approach to learning how to visualize data. Given that one has access to Prism (at my institute it is offered for free for), it is easy and fun for the reader to access the files, play around and understand the construction of these figures. You can jump right in and adapt the figures using own data. Prism is widely offered at institutions and pricing seems reasonable for individual academics (under 200 USD per year). It is less affordable for students (142 USD), but students are resourceful. Hopefully in the future, a group will create an open-source free software, such as R, with the same capabilities. Although written for scientists, the language that Boers uses is straightforward. He is honest and relatable. Sharing a complex matrix graph, Boers states his initial reaction: 'even I am intimidated by this graph... they must be smarter than me (p 146).' With meticulous detail (examples), he challenges the paradigm that complicated graphs are the best and carves a way forward to making complex graph more understandable and powerful. Coming back to the workshop I mentioned, I remember Boers' enthusiasm to share his knowledge with us and have us work with our own data. I am pleased that the style of the book contains this energy.

Making tables and graphs have taken me countless hours, trying to make design decisions which, while informed by the scientific content, lacked a deeper understanding of the process of visualizing data.

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Although aimed at the biomedical sciences, I believe that anyone who works with data would benefit from the insight and hands-on material contained in this book. I encourage everyone to check out short tutorials and access the online material at www.vuuniversitypress.com/data-visualization.