



The origin of *Modern Epidemiology*, the book

Kenneth J. Rothman¹

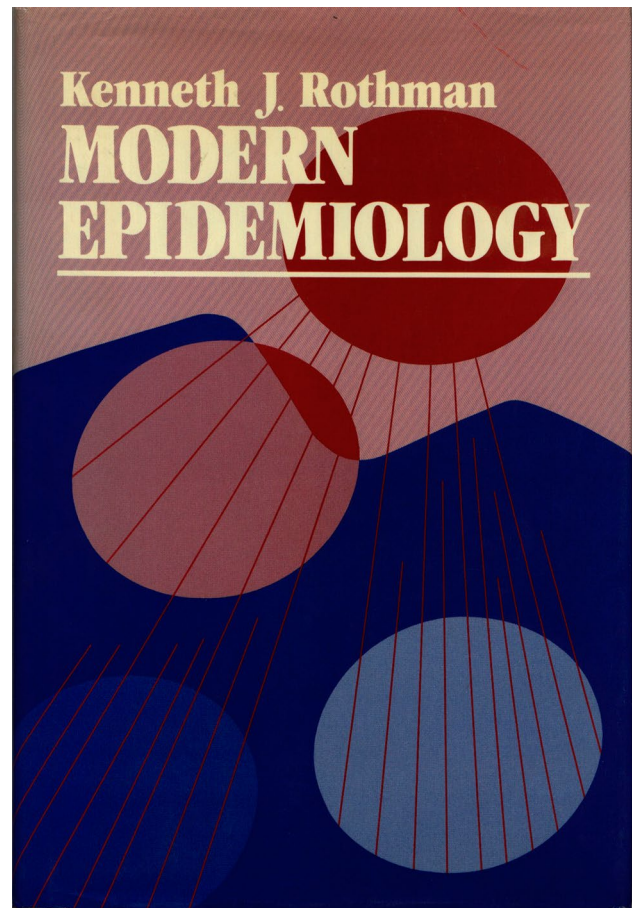
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I am sitting at my desk looking at a print copy of the fourth edition of *Modern Epidemiology* (1), wondering how to respond to the kind invitation from Albert Hofman. He asked me to describe for the EJE how I came to write the first edition, and how the book evolved from there. To me the origin was mundane. In 1981, I was teaching an intermediate methods course at Harvard, and a similar course for the New England Epidemiology Institute, a summer program for epidemiologists. Teaching those courses was an opportunity for me, as any teacher can attest that teaching is a powerful stimulus for learning. I wrote detailed notes for a course handout, and as I wrote I found that there was much I needed to learn. I set for myself the task of describing a concise set of concepts to unite the methods, in plain language that was clear to readers.

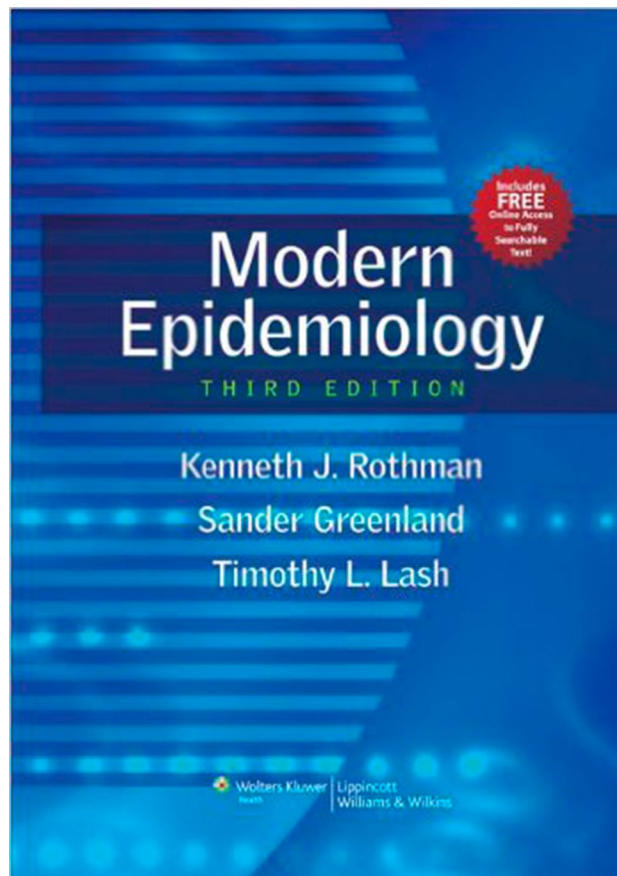
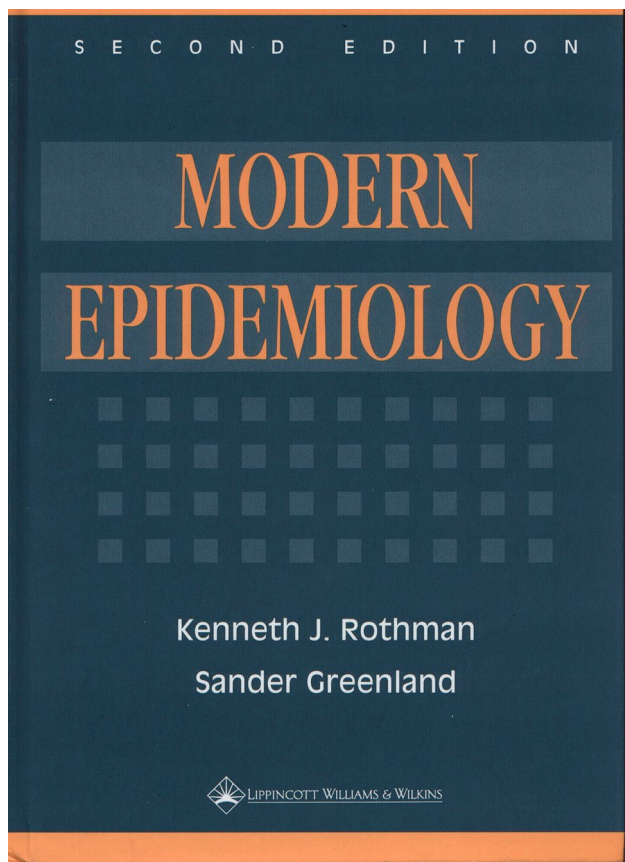
During my epidemiology student days, there were few textbooks for us. We used the book by MacMahon, Pugh and Ipsen (2), an excellent introduction to epidemiology, but appropriate for a first course. When I began to write *Modern Epidemiology*, it was less than 10 years past my doctoral training. The concepts and methods used in epidemiologic research were developing rapidly, and textbooks were lagging. By 1982, however, there was a new one, *Epidemiologic Research Principles and Quantitative Methods*, by Kleinbaum, Kupper and Morgenstern (3), which was rapidly adopted as an advanced text. It was an excellent book, an important milestone, but I thought there was still room for a text with less emphasis on statistics and more emphasis on the concepts.

I also had another motive. There was a central idea that I wanted to present in the book that would challenge mainstream thinking in data analysis. In the 1970s, significance testing was the focus of virtually every analysis. The flaws in the method persuaded me that estimation was far preferable. In 1978, as a newly recruited member of the New England Journal of Medicine editorial board, I had written a commentary making this point (4). Significance testing had been the subject of criticism since the early twentieth century,



✉ Kenneth J. Rothman
krothman@bu.edu

¹ Health Solutions, Research Triangle Institute,
Research Triangle Park, NC, USA



so my reservations were not novel. Still, I considered significance testing to be such a fundamental problem that it required deep changes in practice for students and their teachers, and ultimately practicing scientists, editors and journal reviewers, before it would be abandoned. To help that along, I envisioned a widely used textbook on epidemiologic methods that advocated avoidance of significance testing. That goal propelled me, and not incidentally played a role in my decision to start a new epidemiology journal (5) not long after the first edition of *Modern Epidemiology* was published.

The writing went slowly, filling many nights and weekends. Each of the 16 chapters was a considerable project. Of course, I relied heavily on feedback from colleagues to improve the drafts. One of my draft readers was Anders Ahlbom, who later wrote his own introductory text with Staffan Norell (6), and who in this issue of the journal offers a review of the new edition (7). Other colleagues who gave crucial feedback and encouragement on the first edition included Cristina Cann, Charles Poole, Stephan Lanes, Elizabeth Delzell, Noel Weiss, Alexander Walker, and Patricia Hartge, among many others.

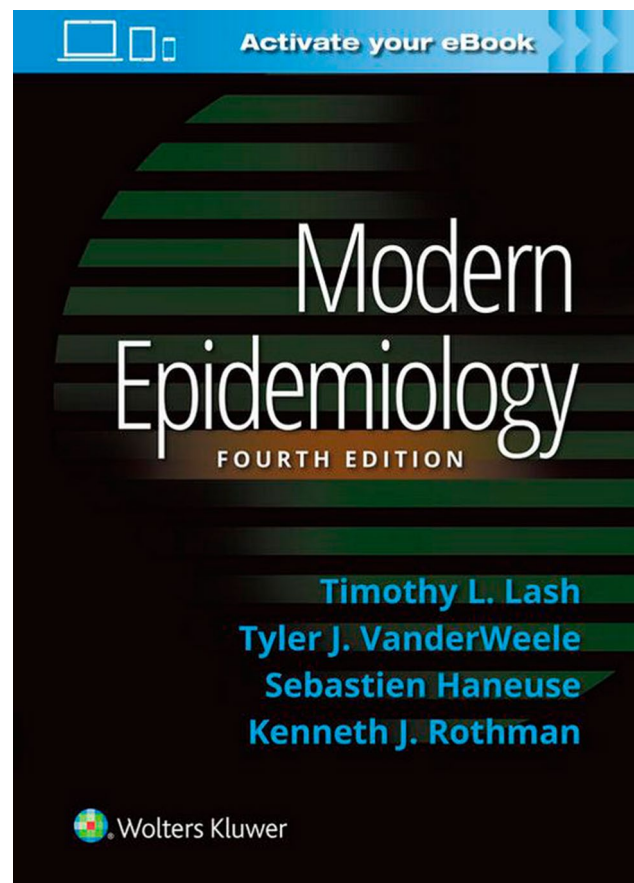
The writing and proofing took five years, and then the book appeared in 1986. I had no expectations, feeling rewarded just to have finished it, but I was naturally pleased

to see the readership grow. On the other hand, it soon became clear that publication of the first edition did not mark the end of the project. The field was growing, and the concepts and methods underlying the work were developing ever more rapidly. I gradually realized that the book could become a snapshot of what would become ancient epidemiology unless there was a plan to keep it alive with revisions. I also understood that continuing this project alone was beyond what I could manage logistically and intellectually. Another colleague who had contributed essential feedback to the first edition was Sander Greenland, who was already a key figure in developing and teaching epidemiologic methods. I needed a collaborator, and Sander was an obvious choice. I was thrilled when he accepted my invitation to co-author the second edition. We also decided that for the book to become a useful reference manual for epidemiologists, we should expand it. We invited experts within several epidemiologic subdisciplines to contribute summaries of the conceptual and methodological challenges in their areas. With the new edition, the book became a hybrid between a text largely written by a small number of authors and a book of edited contributions from invited experts. The second edition appeared in 1998, 12 years after the first edition, at more than twice the size and covering a much wider range of content.

The third and fourth editions followed at roughly decade intervals after the second edition, with three and four authors, respectively. Timothy Lash joined me and Sander as the third author for the third edition. He brought a strong overview of epidemiologic methods evident from his work on bias analysis, which led to its own textbook, published in 2009 (8) (the second edition of this book is expected later this year). He also met the important requirement of being younger than either of the other authors. The book was taking on a life of its own, and needed the steady hand of continuity across future editions. The fourth edition has four authors, after Tyler VanderWeele and Sebastien Haneuse agreed to participate as author-editors, and Sander Greenland bowed out with competing responsibilities. Timothy Lash took on the work of lead author. In my view, he was born to the task, handling every problem far better than I could have.

Publication of the fourth edition was slowed by the SARS-Cov-2 pandemic and the increasing coverage of the book. When it finally appeared in early 2021, it weighed in at 1174 pages spread over 43 chapters, with 35 additional contributors beyond the four primary authors. What began as a single-authored attempt to present a simple, coherent vision of epidemiologic concepts and methods has evolved into a literally weighty collaboration of experts, an entirely different creature. Inevitably, it contains mistakes and will benefit from improvement. I hope there will be a fifth edition and others to follow, capturing the crystallized collective insights of generations of epidemiologists yet to come. The book is already large, so future editors will have to work to keep it to a manageable size. The field moves on, and the book's content moves with it. Its momentum has grown to the point where it appears that it will follow its own path. I was fortunate to be in the time and place where I could set it in motion, and I appreciate that luck had a lot to do with it.

It is said that writing is a solitary endeavor; creating the first edition of *Modern Epidemiology* certainly was. As a means of communication, writing is asymmetric. The writer opens up to the reader, but will seldom know the reader's thoughts. I found this asymmetry both gratifying and slightly awkward. It was fulfilling to package my thoughts into a text that served many readers over several decades. The awkwardness arises because the readers knew the extent, and the limits, of my epidemiologic knowledge, while I knew nothing about the readers. It was never a problem, but it was something I thought about. As each edition after the first became a larger, more collaborative project, the writer's isolation faded. Now I can thumb through the fourth edition and read passages written by others who have opened their minds to me. On a rare occasion I might spot a sentence or phrase that rings a faint bell, a sentence or a snippet of text that may have been carried forward from the earliest of editions, and that is satisfying in itself.



References

1. Lash TL, VanderWeele TJ, Haneuse S, Rothman KJ. *Modern epidemiology*. 4th ed. Philadelphia: Wolters Kluwer; 2021.
2. MacMahon B, Pugh TF, Ipsen J. *Epidemiologic methods*. Boston: Little Brown and Co; 1960.
3. Kleinbaum DG, Kupper LL, Morgenstern H. *Epidemiologic research: principles and quantitative methods*. New York: John Wiley & Sons Inc; 1982.
4. Rothman KJ. A show of confidence. *N Engl J Med*. 1978;299:1362–3.
5. Rothman KJ. *Epidemiology: the journal* (Editorial). *Epidemiol*. 1990;1:3–4.
6. Ahlbom A, Norell S. *Introduction to modern epidemiology*. 2nd ed. Boston: Epidemiology Resources Inc; 1990.
7. Ahlbom, A. *Modern Epidemiology*, 4th edition. TL Lash, TJ VanderWeele, S Haneuse, KJ Rothman. Wolters Kluwer, 2021. *Eur J Epidemiol* (2021). <https://doi.org/10.1007/s10654-021-00778-w>.
8. Lash TL, Fox MP, Fink AK. *Applying quantitative bias analysis to epidemiologic data*. New York: Springer-Verlag; 2009.

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