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Bad Science, by Ben Goldacre

Reviewed by Dave Snell

“There are three kinds of lies: lies, damned lies, and statistics.”— Popularized by Mark Twain, who attributed it to the 19th-century British Prime Minister Benjamin Disraeli (1804–1881).

I want to start the review of *Bad Science*, by Ben Goldacre, with two warnings about it:

1. Language
2. Ideology

Regarding language, this book is written in English—not American English. I must admit that makes it a more difficult read until you get used to the many differences between the two languages. Having lived for a few years in Australia, I was familiar with common terms like the Vinnies (St. Vincent de Paul), the Salvos (Salvation Army), going to a physio (physical therapist) and a chemist (pharmacist). I was not familiar with some of the very common London phrases like the MMR Hoax. It was not referring to a British Enron or the salacious escapades of a movie star, but to the media’s nine-year misguided campaign against use of the Measles, Mumps and Rubella vaccine. Plus, I had to look up some English words that are not common in my limited American vocabulary.

Regarding ideology, Ben Goldacre, M.D., is an iconoclast extraordinaire. He attacks widely held beliefs about the value of homeopathy, mega vitamin supplements and many alternative healing therapies. If you are big fan of any of these, you may find some of the material disturbing.

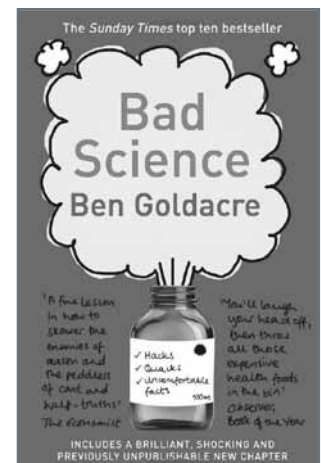
OK, so why do I recommend this book as “must reading” for actuaries who are involved in, or just interested in, predictive modeling, health insurance or statistical inferences?

I endorse *Bad Science* as a good primer on how clinical studies should and should not be conducted; and on how statistics are used and misused to manipulate public opinion. I have not seen such a memorable text on the subject of good and bad statistics since I read *The Nature of Statistics*, by W. Allen and Harry Roberts (1968) over four decades

ago. That ancient paperback was once optional reading for the old probability and statistics actuarial exam and it was far more valuable to me than the required texts and study notes that focus on mathematical distributions and formula derivations.

Two anecdotal examples are still useful reminders to me that there is more to a statistical study than we sometimes assume. One example was a study that tried to determine the average family size at a large school. Each student was asked how many brothers and sisters he had. The resulting average was higher than expected; and the reason, of course, was that families of five children often got as many as five votes, while the single child family only had one vote. Sometimes we need to check for an inherent bias in our studies. Another was a story about a man who had a hearing problem, but could hear well if people spoke up more loudly. He could not afford an expensive hearing aid so he ran a wire from inside his shirt to a small piece of plastic he placed in one ear. Thereafter, he had few hearing problems because most people would notice the plastic and wire, assume he was hard of hearing, and speak louder for him. This introduced me to the psychological biasing impact of studies.

Bad Science is several steps beyond these simple examples and explains the basis of good experimental and statistical techniques; and also bad ones—those that yield inaccurate and misleading results. He gives us best practices for health studies, and then shows how special interests can distort the results from even well planned, double blind, randomized, statistically significant studies. He shows real world examples of how we are fooled into buying needless supplements, useless treatments, and counterproductive



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medicines being pushed by the Big Pharma (pharmaceutical) companies.

A particularly disturbing chapter is a free one he included after the first edition of his book had already been published. This chapter was delayed because he was being sued at the time by a vitamin-pill entrepreneur. A link to the freely downloadable chapter, “The Doctor Will Sue You Now” is at <http://badscience.net/files/The-Doctor-Will-Sue-You-Now.pdf> and the short description of the suit is at <http://www.badscience.net/2008/09/matthias-rath-pulls-out-forced-to-pay-the-guardians-costs-i-think-this-means-i-win/>.

Dr. Goldacre is a medical doctor and a science writer who has the ability to educate and entertain at the same time (albeit in that sometimes bothersome dialect of English). He also addresses several commonly held, but incorrect, beliefs about clinical studies. For instance, some well-meaning consumer advocates say that giving placebos in trials is unethical—everyone should have the benefit of the improved medication. That, of course, assumes that the medication is better, which is what is being tested. We don’t know the result of a trial until we actually perform it. Duh, that’s why we do these experiments in the first place! Furthermore, the assumption is usually that the new medicine will be either better, or not better. Seldom do we consider the possibility it will be worse, or downright life threatening, like the painkiller Vioxx, which caused tens of thousands of heart attacks. As I am writing this review, a unit of Merck & Co., the second-largest U.S. drugmaker,

pleaded guilty to a criminal misdemeanor charge as part of a \$950 million settlement of a U.S. government probe of its illegal marketing of the painkiller Vioxx. Likewise, Thalidomide, which caused thousands of infant deformities, was not the ethical choice over a placebo. Current ethical side-by-side clinical trials involve giving the new treatment versus a placebo in situations where a placebo is warranted, or the new medicine (or treatment or procedure) versus the current best medicine (or treatment or procedure) where the illness or condition is one that requires treatment.

Placebos, however, are not as obvious as one might think. The author shows us that two pills are deemed better than one, capsules are better than pills, injections better than capsules, fancy packages better than plain ones, expensive placebos better than inexpensive ones, and that even color (or in his dialect, colour) can impact the results of the efficacy of the placebo.

Goldacre has an entire chapter on placebos, and I found it fascinating. Here is one example of the power they can have:

“About a hundred years ago, these ethical issues were carefully documented by a thoughtful native Canadian Indian called Quesalid. Quesalid was a skeptic: he thought shammanism was bunk, that it only worked through belief, and he went undercover to investigate this idea. He found a shaman who was willing to take him on, and learned all the tricks of the trade, including the classic performance piece where the healer hides a tuft of down in his mouth, and then, sucking and heaving, right at the peak of his healing ritual, brings it up, covered in blood from where he has discreetly bitten his lip, and solemnly presents it to the onlookers as a pathological specimen, extracted from the body of the afflicted patient.

Quesalid had proof of the fakery, he knew the trick as an insider, and was all set to expose those who carried

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it out; but as part of his training he had to do a bit of clinical work, and he was summoned by a family ‘who had dreamed of him as their saviour’ to see a patient in distress. He did the trick with the tuft and was appalled, humbled and amazed to find that his patient got better.

Although he continued to maintain a healthy skepticism about most of his colleagues, Quesalid, to his own surprise perhaps, went on to have a long and productive career as a shaman.” p.77

The purpose in *Bad Science* is not to summarize best practices in clinical studies and their statistical interpretations. It is to expose the “bad science” techniques being used to mislead the public. His anecdotal examples though give the best practice examples in a more memorable way than a list of bullet items in a study note.

For example, he explains in detail how the public came to accept the “fact” (never substantiated by any legitimate study) that fish oil pills will improve your child’s intelligence. He then says, “Friends tell me that in some schools it is considered almost child neglect not to buy these capsules, and its impact on this generation of schoolchildren, reared on pills, will continue to bear rich fruit for all the industries, long after the fish-oil capsules have been forgotten.”

But what if your audience is more sophisticated than the masses? What then can you do if you are dealing with academics or doctors who have been trained to notice obvious flaws such as “no blinding” or “inadequate randomization?” Then, you do what so many industry studies do: choose to study winners, compare against a useless control, use inadequate dosages of competing drugs, or use very high dosages of them to induce side effects. The list of tricks goes on, and Goldacre shows us many examples in real life.

He quotes noted physicist Richard Feynman who sarcastically marveled at the coincidence of seeing a car in the park-

ing lot with the license plate ARW 357. “Can you imagine? Of all the millions of license plates in the state, what was the chance that I would see that particular one tonight?” Then, Goldacre gives us a cardinal rule of any research involving statistics: “you cannot find your hypothesis in your results.”

“Imagine I am standing near a large wooden barn with an enormous machine gun. I place a blindfold over my eyes and—laughing maniacally—I fire off many thousands and thousands of bullets into the side of the barn. I then drop my gun, walk over to the wall, examine it closely for some time, all over, pacing up and down. I find one spot where there are three bullet holes close to each other, then draw a target around them, announcing proudly that I am an excellent marksman.” p. 275

I am so tempted to add many more quotes from the book. Goldacre has taught me, through the absurd stories of actual events, how easy it is to mistake coincidence for causality; or to distort a result without changing any of the facts; or to implant in the public minds a truth which does not exist.

Bad Science is a good book for actuaries to read. ▼