

Book Reviews

Calculated Risks: How to Know When the Numbers Deceive You, by Gerd Gigerenzer, 320 pp, hard cover, \$25, ISBN 0-7432-0556-1, New York, NY, Simon & Schuster, 2002.

Gerd Gigerenzer clearly demonstrates that innumeracy is common among physicians, and is exploited by medical vendors. For that alone, I could not recommend this book more highly.

The object of this book was to clear the mist from typically misleading, if not fraudulent, claims for the effectiveness of drugs and the accuracy of clinical assays. Gigerenzer's focus is on deceptive presentation of data, usually in the form of relative risk (RR) rather than absolute risks or number needed to treat (NNT). Earlier books dealt with similar foibles in medicine, including the lack of logic of testing for diseases for which there was no treatment.^{1,2} Gigerenzer writes very clearly, using clear diagrams and copious notes and references. The index is superb.

A typical simple example: If you were informed that by taking a drug, using a device, or changing her diet, your patient could reduce her risk of some horrible condition or early death by 50%, would you prescribe it? Whatever your answer, you could not make a valid decision without more data. Suppose that the chance of the horrible condition or early death had been two in a million before the intervention, and one in a million after the intervention, with an RR=0.50 with treatment. Would you still prescribe it?

Gigerenzer points out with many examples that relative risk is always a larger number than absolute risk. One example is a 5-year study of pravastatin—the anticholesterol drug Pravachol—vs. placebo. All-cause death was said in the original paper to be reduced by 22% (RR=0.78). Would you prescribe it? The absolute change was 0.9%, or just 0.18% per year! Would you still prescribe it? It is also known that studies of drugs sponsored by their maker are biased, so even the 0.9% was probably exaggerated.³⁻⁵

What Gigerenzer suggests is that natural frequencies be used, or absolute risks, not relative risks. So he shows that the

false positive rate of mammograms is such that a woman who has ten annual ones will have a 50% chance of a positive diagnosis. Those women who receive a positive have an 11% chance that they actually have breast cancer. This actually means that 89 of 100 positives in mammography are false! Yet all the women with positive tests are subjected to extreme mental stress and, usually, biopsies at the least. Use of the Anti-Malignin in Serum Antibody (AMAS[®]) cancer test, now available for about 10 years, would be preferable.⁶

Disregarding for now the evidence that a positive test for human immunodeficiency virus (HIV) means that one will develop acquired immunodeficiency syndrome (AIDS),⁷ the HIV test (Enzyme-Linked Immunosorbent Assay or ELISA and Western Blot, performed once) is very accurate, with a mere 0.1% chance of a false positive and 0.01% chance of a false negative. Seemingly, this is a very good test.

If your patient is in a low-risk group and has a positive test, what are his chances that he really has HIV? Just one in two! How? Since of 10,000 low-risk men, one will really have HIV, and that man will indeed test positive, and since of 9,999 men without HIV 9,998 will test negative and there will be only one false positive, the total from a decision tree, as Gigerenzer shows, is one false positive of the two positives. How many divorces and suicides would have been prevented if people were told this? Half? The important message was to construct a decision tree, then simply sum up the results, and express them as frequencies, such as the number of false positives per 100 positives.

Informed consent was shown to be almost nonexistent for various tests and treatments, both in patient interviews and pamphlets, mostly because of misleading presentation of benefits (usually as relative risks) or accuracy, in the absence of the actual prevalence of the condition.

The old medical method of “number needed to treat” (NNT) to prevent one death or condition is another recommended method for presentation of data. Then it becomes clear what a cost-benefit ratio might be. If 1,000 people must be treated for 10 years to prevent one “extra” death

during that period, the NNT is 1,000 for that period. If the drug costs \$1,500 per year, the cost to prevent one premature death is \$15,000,000—an unreasonable and unaffordable amount.

Gigerenzer also shows the true false positive rate of DNA testing—one in 200 for a certain lab—just because of careless errors and errors of judgment. Thus, DNA testing is very fallible. The DNA tests require interpretation of whether there is a match; that is why there are odds given for the validity of the match, which is not absolute.

He also explains the prosecutor's fallacy: When the odds of matching a DNA sample are one in 100,000 and there is a match for a defendant, the prosecutor always says that there is that same chance that the defendant is innocent: 1/100,000. But what if there are 20,000,000 others in the same metropolitan area? That would mean 199 other local people who would have had a match. Who knows whether the right one was caught?

This is the problem with DNA banks for all citizens. There are more matches than one would suppose.

A final section, “From Innumeracy to Insight,” gives examples of how presentation of data influences judgment, also describing fears with not much probability, and the opposite.

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HMG-CoA Reductase Inhibitors, by M. Torzewski and G. Schmitz, eds. 151 pp, hard cover, \$129, ISBN 376436307X, Boston, Mass, Birkhauser, 2002.

HMG-CoA reductase inhibitors are essentially the statin drugs: atorvastatin (Lipitor), cerivastatin (Baycol, withdrawn 8/01), fluvastatin (Lescol), lovastatin (Mevacor), pravastatin (Pravachol), simvastatin (Zocor), pitavastatin, and rosuvastatin (Crestor). These drugs were introduced to lower total cholesterol (TC) levels, and especially LDL-cholesterol levels, ostensibly to prevent coronary heart disease.

HMG-CoA Reductase Inhibitors consists of eight chapters in the form of review articles of the sort normally found in medical journals. These are devoted to the pharmacology and supposed benefits of statin drugs. The writing is in expert medical language and is mostly consistent, well written, well edited, and well referenced, at least in quantity. The index, however, is somewhat inadequate.

All of the chapters attempt to justify the wide use of statin drugs to lower TC and LDL by citing references in support of claims that high levels of TC and LDL have been correlated with cardiovascular disease, in the absence of an age adjustment (pp 1, 19, 35, 81, 84, 99, 121, 126). In fact, evidence supporting a contrary view has been cited in our own *Journal of American Physicians and Surgeons*, as well as in other sources.¹⁻³

The purported benefits of the statin drugs, beyond a large but meaningless lowering of TC and LDL, long recognized as a worthless surrogate endpoint,^{1,3,4} are usually expressed in this book as lowered relative risks (RR) of mostly nonfatal heart attacks without the slightest indication of the low magnitude of the more meaningful reduction of absolute risk, or of all-cause death rates (pp 101, 103, 106, 115, 122, 124, 137). This misrepresentation has been noted.⁵

The usual promotion of pravastatin based on a 22% drop in all-cause mortality in the WOSCOPS trial (p 106) was unaccompanied by the information that this represented only a 0.9% drop in absolute risk over the 5-year trial period, or 0.18% per year. The higher all-cause death rates in two of the large trials of lovastatin were ignored, as was the higher breast cancer rate (RR=1,500%) in the CARE trial with

pravastatin.¹ Moreover, given the evidence for bias in studies sponsored by pharmaceutical companies, as these were, one might even wonder about the validity of the 0.9% figure.⁶⁻⁸

Besides cancer, the other side effects of statins listed in the book were incomplete, and should have included constipation, myalgia, myopathy, polyneuropathy, liver and kidney damage, congestive heart failure, and amnesia, as well as skin rash, headache, abdominal pain, nausea, diarrhea, and lupus-like syndrome.⁹ Adverse effects were said to affect only 2% (pp 115-116) or 2-6% (p 123) of patients. A recent meta-analysis, however, noted that the rate of side effects in patients was 20% higher than the placebo rate (65% vs. 45%), and that there was no change whatever in the all-cause death rate for atorvastatin.¹⁰ The PROSPER trial on pravastatin showed no change in the all-cause death rate, and increased cancer and stroke rates.¹¹ Statins are commonly used at a dose to lower TC to <160 mg/dL, a level noted to be associated with higher cancer rates, as reported at a National Heart, Lung and Blood Institute conference.¹²

Statins decrease the body's production of the essential coenzyme Q-10 and dolichol, among other things, yet this effect was not mentioned as a problem in any chapter. While this was shown in one biochemical diagram (p 65), it was not in another (p 82). Low CoQ-10 levels are strongly associated with congestive heart failure.^{13,14}

"Statins are contra-indicated during pregnancy and breastfeeding. The reason for this is that cholesterol is an essential component for fetal development, including the synthesis of steroids and cell membranes" (p 116). The authors fail to point out, however, that cholesterol is also essential for steroid and cell membrane synthesis in adults.

The rare familial hypercholesterolemia, in which TC > 400 mg/dL, was represented as more deadly than it really is (pp 99, 111).²

There was some recognition that statins operate to lower nonfatal heart attack rates by mechanisms other than cholesterol lowering, but none that their desirable effect on lowering thromboxane A2 levels is less than men can obtain with buffered aspirin (p 71),¹⁵ or that the desirable effect of raising nitric oxide (NO) levels is less than one can obtain with the supplement L-arginine with no side-effects. These effects of statins are independent of initial or final

TC or LDL levels,¹⁶ and thus there is no way to determine who should be treated, or what the dose should be.

An entire chapter is devoted to the cost-benefits of statin use (pp 138ff). Since use of statins for primary prevention of CHD has been shown to increase all-cause mortality by 1% over a 10-year period,¹⁷ and to have very little to no effect in secondary prevention of death,^{11,15,18,19} it would seem that the cost-benefit does not exist.

Despite its shortcomings, this book might be of some use to those trying to find a legitimate use for statins by studying their pharmacology in detail, and who want an initial overview of the literature, however incomplete.

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The Modern Nutritional Diseases and How to Prevent Them, by Alice Ottoboni, Ph.D. and Fred Ottoboni, M.P.H., Ph.D., 217 pp, soft cover, \$29.95, ISBN 0-915241-03-X, Sparks, Nev., Vincente Books, 2002.

The cause of the modern epidemics of heart disease, stroke, type-2 diabetes mellitus, obesity, and cancer is, in these authors' view, the modern American "heart healthy" diet, promoted for some 40 years with the assistance of the U.S. federal government.

Nutritional dogma epitomized by the famous Food Pyramid promulgated by the USDA Center for Nutrition Policy and Promotion is, the Ottobonis say, based "at best, on bad epidemiology or, at worst, on fiction."

Expecting a challenge from advocates of traditional nutrition, the Ottobonis are well prepared with extensive references. Their work deserves careful scrutiny and debate because its implications are revolutionary. Unfortunately, the mainstream is apparently ignoring the book.

The facts about the epidemics are sobering.

A major decrease in an important risk factor—the number of smokers has declined from 42 to 24 percent of the population over the age of 18—has resulted in little change in the two most frequent causes of death. Cancer deaths have decreased only slightly since 1993. Although deaths from heart disease have dropped in persons aged 45-64, probably thanks to improved diagnostic tests and early intervention, cardiovascular deaths in younger and older age groups continue to increase. Congestive heart failure is the single most frequent cause of hospitalization in patients over the age of 65.

Meanwhile, type-2 diabetes has grown steadily from 1.5 million cases in 1958 to 10.3 million in 1997. The prevalence of obesity, defined as a body mass index (BMI) of 30 or greater, has increased from 15 percent in 1980 to 27 percent in 1999.

Could these facts be related to the vast, uncontrolled dietary experiment that has been underway over the past century? The use of sugars has doubled. Intake of starch from grain and potatoes has increased by 40 percent. Egg use has dropped significantly. And the average American now consumes about 40 pounds per year of new fats and oils that were never previously part of the human diet.

Almost every continuing medical education course on heart disease seems to allude to cholesterol and saturated and unsaturated fats, and recommends a low-fat, thus high-carbohydrate diet while admitting that it doesn't work. Until I read this book, I had never heard of the remark by noted cardiologist Dudley White, who started his medical career in 1921 and saw his first myocardial infarction in 1928: "Back in the MI free days before 1920, the fats were butter and lard and I think that we would all benefit from the kind of diet we had at that time when no one had ever heard the word corn oil."

If one wishes to lower blood cholesterol, one should focus not on intake of cholesterol, which is rather poorly absorbed, but intake of fructose. The book outlines the biochemical basis and cites the experiments that validate this advice. It also explains why a high intake of carbohydrates makes people fat. A calorie may be a calorie, but the human body is not a bomb calorimeter.

The ubiquitous FDA-mandated food labels convey the impression that all unsaturated fats are alike. In fact, the Ottobonis explain, the modern American diet is severely deficient in the essential omega-3 fatty acid alpha-linolenic acid and has unprecedented amounts of the omega-6 essential fatty acid linoleic acid. The ratio is very important. Also, the partial hydrogenation of vegetable oils, which otherwise go rancid very quickly, produces harmful trans fatty acids. Food labels are just beginning to include the content of trans fatty acids (without explaining their importance).

Organizing a vast array of material with interlocking implications is a challenge. As the authors acknowledge, there is significant repetition and overlap,

sometimes annoying if one is reading cover to cover but possibly helpful if picking and choosing a chapter here and there. The index is good. A list of abbreviations would have been very useful. The biochemical charts are indispensable. There are many informative tables.

The references range from solid biochemistry and clinical research to more popular books and web sites. The serious physician should probably review some of the literature for himself, but this book is an excellent entry point.

Any physician who gives nutritional advice ought to be familiar with the contents of this book, as should physicians whose patients may be taking dietary supplements or various herbal preparations. The chapter on nutritional supplements is sensible and well-balanced.

Other topics of interest include: drug-induced nutritional depletion; the possible role of nutrition in senile mental disorders; and the calculation of protein and fat requirements.

Quite apart from the specific subject of nutrition, the book is of interest for its insights into the politicized science of our day, and the dangers of public-private partnerships. Although the world may believe that the New Cholesterol Guidelines were the product of unbiased, government-funded research, the Guidelines actually "seem to have bypassed all of the normal checks and balances required of agencies of the United States government."

As with the Clinton Task Force on Health Care Reform, the expert panel held no open meetings with advance notice, and did not solicit, consider, or preserve public input. The Guidelines were published in *JAMA*, not the Federal Register, and were promulgated by press conference.

Could there be undue influence from manufacturers of statin drugs and other special interests? One can speculate. The Ottobonis ask why, in the face of irrefutable data about the use of the low-fat, high-carbohydrate "heart healthy" diet and the concurrent increase in diseases the diet was supposed to prevent, an expert panel would recommend intensified use of the diet.

"When you see water running uphill, look for a pump!" they advise.

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