

On the Numerical Allure of Statistics

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In the weeks leading up to his death, Ivan Illich and I had met regularly to ponder the question of how the destruction of the sensory, concrete present through statistical risk thinking can be understood and written about. Gerd Gigerenzer's *Calculated Risks* provided us with an occasion to put our collective ruminations into the form of a book review. Several times Illich sent me back home with my early drafts, and ultimately we spent many hours discussing formulations and forging sentences. On the morning of his unexpected death on 2 December of 2002, he made his last annotations to the text. I then incorporated them alone.

Gerd Gigerenzer. *Calculated Risks. How to Know When Numbers Deceive You*. New York: Simon&Schuster, 2002. ISBN 0-7432-0556-1. Pp., v., 310.

In the middle of the 1970s, a study by the National Institute of Mental Health found that the majority of patients left their physicians with tranquilizer prescriptions.¹ That study triggered a remarkable debate on the iatrogenic consequences of this dumbing down. Today, patients get into danger not only of having their health ruined through bizarre treatment methods, but also their future through statistical soothsaying. Whether a cancer screening or at a prenatal or post-stomach ulcer check up, almost inevitably patients leave appointments saddled with a doctor-attested risk, an alleged prognosis, which then hangs over their present-day lives like a Damoclean sword. The epidemic bewilderment/pathogenesis ?? caused by the confusion between the attribution of a risk profile and a diagnosis has thus far evaded the discussion it merits.

Gerd Gigerenzer comes as close as one can to raising this issue. For the past ten years he has headed Germany's top institute for research into education, the Max-Planck Institute for Human Development in Berlin. In *Calculated Risks* he proves himself a remarkably effective teacher. Two of his points are especially cogent.

First is a contrast between enormous efficiency and the highly questionable effectiveness of a snowballing mass of data. Procedures such as mammography, HIV testing, and the hunt for genes that predispose one to obesity,

heart failure, or alcoholism generate both manifold anxieties and excuses, but do not add one iota to our knowledge about anyone's medical condition. They broaden the spectrum of fearsome possibilities, the horizon of things that might happen.

Statisticians use the flood of data to calculate probabilities which express nothing but abstract frequencies. In the consulting room, these frequencies are boiled down into risks and chances, actuarial notions that are then understood by the client as threats. In the physician's office, a breast cancer risk intimates to the patient a threat to her own life whereas in fact, by definition, risk measures the frequency with which something will happen in the statistical universe from which the sample has been drawn. A prediction of a 30% probability of rain is currently misunderstood by most people: It really means that a meteorologist is the creator of a fictitious tomorrow such that if it were to occur a hundred times, tomorrow would be a rainy day on 30 occasions. To grasp the irrelevance of this risk to the only real tomorrow that exists seems to Gigerenzer to be a competency that is as elementary today as multiplication tables were before the invention of the pocket calculator.

According to the author, the capacity to distinguish between a chimera and a wrench must be part of elementary education. Otherwise citizens will not grow up. They will either romantically continue to trust in popular wisdom about reality or will be putty in the hands of propagandists. Thus, Germany's headmaster feels called upon to teach a fourth "R" to update professionals as well as laypersons. In doing so, he makes his second point: Critical statistics are not only a must for survival in a world flooded by risks and chances but also the key to grasp "probability" as the foundation of the world in which we live.

A test enables statisticians to reduce a testee to one more case they can add to a stigmatized population, just as a genetic fingerprint adds an accused to the population of suspects. But while those innocently accused know they need not to feel any guilt, anyone who tests positive for HIV will henceforth be troubled, regardless of the validity of the test. Gigerenzer's emphatic warning drives home both the danger of turning oneself into a case and relying on unchecked common sense.

In a previous book, *Cognition as Intuitive Statistics*,² Gigerenzer has documented how, toward the middle of the twentieth century, the human mind was

turned into a calculating device. He found that his psychologist colleagues concluded the brain was incompetent because it was ignorant of Bayes' theorem and thus its estimates did not jibe with statistical calculations. To be a guide in the contemporary world, sound judgement needed updating.

In this book, Gigerenzer himself came to the conclusion that if one does not want to be taken for a ride in the modern world, one cannot avoid adopting its rules. "My agenda is to present mind tools that can help my fellow human beings to improve their understanding of the myriad uncertainties in our modern technological world" (p. 8). Most of the examples he cites document the necessity of having an enlightened grasp of everyday probabilities that are taken from medicine and law. Consistently they make the same point: that innumerable disasters could be avoided if experts and non-experts alike had a basic grasp of statistics. Quite a few people are now behind bars because the judge mistook the DNA fingerprint as a watertight form of evidence. Data helpful in placing those tested into a statistically defined class are taken for clinical observations that congeal into a medical diagnosis. After a positive HIV test, David was on the verge of suicide before he was told that every second such test result is a false positive. Every year 100,000 German women undergo surgery—from tissue samples to mastectomy—on the basis of false-positive mammograms. From this perspective, it seems grotesque that innumerable physicians, jurists, and AIDS counselors peddle tests to their clients only then to mystify them by interpreting the test results to them as something akin to a diagnosis.

No doubt, Gigerenzer is a remarkable teacher. Again and again we were shocked by our own guilelessness. Of ten women with positive mammogram results, only one turned out to have breast cancer; the HIV test is calibrated in such a way that when administered to the general population, half of the time people with a positive result turn out not to be infected. Just as enlightening as the book's discussion of the positive predictive value of screening tests is its treatment of the difference between relative and absolute risk. Again mammography serves as an example. The promoters of this procedure stress that regular testing will reduce mortality from breast cancer by 25%. What this impressive figure says is the following: Over a ten-year period, four women in the control group had died of breast cancer, as opposed to three in the screened group. Screening thus has reduced the so-called relative risk by one fourth:

from four deaths to three. However, if one looks at the absolute risk, the risk has been reduced by only 0.1%, from four to three deaths in a thousand, which means that 999 women are unnecessarily subjected to mammographies, and dozens made anxious by false-positive test results.

The psychologist does understand that medicine is a prime example of the irrationality of a society dominated by what Jaques Ellul has called the technological imperative: What can be done ought to be done. For Gigerenzer, the publicly promoted mammography fad stirs up fears while it should be used to stress the counterproductive functions inherent in all mass screenings. But nowhere does he even pose the question of how it was that such a pathogenic diagnosis could ever have become a need. He does not ask how it has become possible to spawn in healthy citizens an intense desire for experts and machines to prove to them that they are - probably - right in feeling healthy.

Gigerenzer does not go this far. Instead the educational researcher presents his statistics lesson as a panacea. As we have already seen in his discussion of trust in medicine, the promised *ABC of Scepticism*³, as the German title reads, remains superficial. He would like to teach his readers merely the enlightened weighing of benefits and risks. The intellectual presuppositions of these concepts, however, remain shrouded in darkness: namely, a form of cohort thinking through which the individual citizen is turned into a faceless member of a totality.

Nowhere does Gigerenzer stress that, by definition, there is no such thing as a personal risk. A “personal risk” is an oxymoron, a self-contradiction. The book’s greatest weakness is indeed that the psychologist who has been engaged for years in the popularization of statistical terms at no point deals with this paradox. Probabilities estimate the frequency of an event within a fictive cohort, in a population; this much Gigerenzer makes clear. Not a word is said about the limited ability of such probabilities to make any meaningful statements and their peculiar transformation into a threatening risk as soon as it finds its way into clinical practice. And here Gigerenzer would have had an opportunity to call attention to an epidemic misunderstanding, to the misleading presumption that a doctor-attested risk estimates the degree of threat to a patient. Thereby the author allows one of the greatest dangers of the unleashing of

statistical terms to fall by the wayside. Almost unavoidably the conversation with a doctor, geneticist or AIDS counselor creates fear, because here probabilistic calculations mutate into concrete predictions or even into diagnoses.

Probabilities, however, refer by definition not to any concrete person but to a constructed case; never to the “I” or “you” in a colloquial statement, but always only to a case taken from a statistical population. When on top of everything Gigerenzer occasionally lumps statistical probabilities together with a tangible danger, he himself falls into the trap he set out to avoid. He lends the appearance of concreteness to an abstract frequency and charges it with colloquial meaning. He transforms the statistical concept into an allegedly tangible reality. On a higher level Gigerenzer thus reproduces what he criticizes: He does not elucidate but rather rubs the reader’s nose in risk thinking.

In *Calculated Risks*, the “responsible citizen” is reduced to an “informed consumer”. The author is not concerned with a healthy scepticism with regard to the meaning of a doctor-attested “breast cancer risk” or an abstract laboratory result such as “HIV positive” or “Trisomie 21”. When he reports on the counter-productivity of the modern system of medicine, he does not hold the health craze of society to be the root of all evil but rather that which it promises to overcome: an outdated human condition. As a researcher into cognition Gigerenzer has come to the conclusion that homo sapiens has not yet sufficiently adapted to the world he has created. Instead of counting on risks, people still trust their senses. Here he wishes, as an educational expert, to provide assistance. If it were up to him, a nation wide three-tiered curriculum on statistical literacy would be put in place tomorrow. For today, only those people can be considered responsible who have learned how to regularly inform themselves about risks and to correctly weigh them. If the calculation of probability were only studied properly, Gigerenzer believes, then even the average consumer would be in a position to get along in a (mis)calculated world.

The probability of getting into an accident, the positive predictive value of mammography, and the health risks of enjoying a glass of wine should transform the innumerate into enlightened rational human beings. The new responsible citizen cannot remain in possession of his senses. When Gigerenzer declares sensory certainty to be

an illusion produced by evolution, he suggests to rely on nothing except a collection of values whose significance has been statistically checked. Gigerenzer's expectations for responsible citizenship apply only to those who subordinate heart and mind to the calculation of risk.

¹ See Balter, M., Levine, J. and Manheimer, D. *Cross-National Study of the Extent of Anti-Anxiety/Sedative Drug Use*. New England Journal of Medicine 290, 1974. pp 769-774

² Gigerenzer, G. and Murray, D.J. *Cognition as intuitive statistics*. Hilldale, NJ: Erlbaum, 1987.

³ Gerd Gigerenzer. *Das kleine Einmaleins der Skepsis. Über den richtigen Umgang mit Zahlen und Risiken*. Berlin: Berlin Verlag, 2002.