Fact or Fiction?



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Beware of Statistics

"There are two kinds of statistics, the kind you look up, and the kind you make up." Rex Stout¹

"There are cultures in which people believe that some objects have magical powers; anthropologists call these objects fetishes. In our society, statistics are a sort of fetish. We tend to regard them as though they are magical, as though they are more than mere numbers. We treat them as powerful representations of the truth. We act as though they distill the complexity and confusion of reality into simple facts. We use statistics to convert complicated social problems into more easily understood estimates, percentages, and rates. Statistics direct our concern; they show us what we ought to worry about and how much we ought to worry. In a sense, the social problem becomes the statistic and, because we treat statistics as true and incontrovertible, they achieve a kind of fetish-like, magical control over how we view social problems. We think of statistics as facts that we discover, not as numbers we create."

All of the above is from Joel Best s new book, *Damned Lies And Statistics*.² This book is a helpful guide to spotting bad statistics and learning to think critically about these influential numbers. Startling statistics shape our thinking about social issues. But all too often these numbers are wrong. People use statistics to support particular points of view, and it is naive simply to accept numbers as accurate, without examining who is using them and why.

John Paulos uses the term *innumer*acy— an inability to deal comfortably with the fundamental notions of number and chance—which plagues far too many otherwise knowledgeable citizens.³ Joel Best notes, "The media are not immune to innumeracy; reporters commonly repeat the figures their sources give them without bothering to think critically about them. Reporters want to report facts, activists numbers look like facts, and it may be difficult, even impossible to find other numbers, so the media tend to report the activists figures. And once a number appears in one news report, that report is a potential source for everyone who becomes interested in the social problem; officials, experts, activists, and other reporters routinely repeat figures that appear in press reports. The number takes on a life of its own, people repeat bad statistics."² The lesson should be clear: bad statistics live on.

A common form of mutant statistic involves transforming a number s meaning. Usually, this involves someone who tries to repeat a number, but manages to say something different. Best uses the example of anorexia nervosa in young women. "Activists seeking to draw attention to the problem estimated that 150,000 American women were anorexic. At some point this number began appearing as the number of women who died from anorexia, even though only about 70 deaths per year are attributed to anorexia. However, the transformation of the numbers took on a life of its own and each repetition ensured that the mutant statistic would live on. Advocates repeated the erroneous figure in influential books, in newspaper columns, on talks shows, and so on."2

Sometimes it s not that two bits of data can contradict one another: its that the same bit of data can be read or presented in at least two ways. Murray and his coauthors of It Aint Necessarily So report: "A classic example of this phenomenon is the contrasting newspaper coverage of a twocar race between Soviets and Americans during the Cold War. An American newspaper described the race this way: "American car beats out Soviet competitor." But a Russian newspaper told the same story somewhat differently: "Soviet car finishes second; American car is next-to-last." The Russian summary was just as accurate as the American one; the two accounts told

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the same story, only in ways designed to leave the reader with very different impressions."⁴

More from John Paulos: "If the number at issue is a sum or product, or is otherwise mathematically dependent on several other numbers, only one of them need be imprecise for this imprecision to infect the given number. The joke about the museum guard who told visitors that the dinosaur on exhibit was 90,000,006 years old is a good illustration. Upon questioning, the guard explained that he was told the dinosaur was 90,000,000 years old when he was hired, six years before."⁵

Another example involves a dissertation for a research project leading to a PhD degree that began with this prospectus: "Every year since 1950, the number of American children gunned down has doubled." Best² thought the student had made an error in copying it, but when he checked the journals 1995 volume he found the same sentence. What's so bad about the "grabber statement? Assume that one child was gunned down in 1950. If the number doubled each year, in 1951 there were two children gunned down, four in 1952, 32,768 by 1965 and the number would have passed one million in 1970. Best tracked down the original source of the statistic, the Children's Defense Fund (CDF). CDF s yearbook of 1994 does state: "The number of American children killed each year by guns has doubled since 1950." Note that the CDF claimed there were twice as many deaths in 1994 as in 1950, yet the article the graduate student referenced had reworded the claim and created a very different meaning. Yet all of this was not caught by the graduate student, the author of the original journal article, nor the editor of the journal that published the original paper.² All too often, bad statistics endure because no one questions them and points out their flaws.

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Be cautious when you hear that some disease has suddenly increased in numbers. Statistics on mortality data produced by the National Center for Health Statistics (NCHS) have undergone a number of significant revisions.6 Under the protocols of the World Health Organizations International Classification of Diseases, 10th Revision, which went into effect in the U.S. with the 1999 data, the NCHS has substantially changed the data for many causes of death. As Doyle says, "A notable one is Alzheimer s, which will jump by at least 55 percent above the level reported for 1998. This increase does not reflect a sudden surge in mortality but a change in classification, which nonetheless will have a substantial bearing on the epidemiology of the disease."6

Best notes, "Occasionally there is deliberate manipulation, conscious attempts to turn statistical information to particular uses. Data can be presented in ways that convey different impressions, and it is not uncommon for advocates to choose selectively which numbers they report, and to pick the words they use to describe the figures with care. That is, some numbers are selected because they promise to persuade, to support the advocates positions. This need not be dishonest; advocates making a case can make it clear that they ve chosen to interpret statistics in particular ways. But very often the questionable interpretive work remains hidden, and we have every reason to be suspicious of both the numbers and the advocates honesty when mutations are concealed from the audience."2 World Health Organization Director Christopher Murray reports, "Cancer fighters tell you that their crisis is deepening, and more research money is urgently needed. Those doing battle with malaria make similar pronouncements, as do those working on TB. If all the claims are added, you wind up with a theoretical global death toll that "exceeds" the number of humans who die annually by two-to threefold."7

Extrapolation

Trends can t predict the future. Anyone can exploit temporary associations, but they most often provide no valuable information. Paulos tell this story, "After noting that olive oil comes from squeezing olives, palm oil from compressing palm fruit, and peanut oil from mashing peanuts, Lily Tomlin has inquired about the source of baby oil."⁵

The icon of American beauty, Miss America is becoming thinner and thinner, reported researchers at Johns Hopkins. Body Mass Index (BMI), the present technique in vogue for measuring body thinness (or obesity) dropped from 22 for Miss America in 1920 to 17 for Miss America 1990. *Time Magazine* showed that at this rate the BMI of Miss America could reach zero in about 320 years.⁸

Mark Twain summed up the nonsense side of extrapolation in *Life On The Mississippi:*⁹

"Now if I wanted to be one of those ponderous scientific people, and 'let on to prove what had occurred in the remote past by what had occurred in a given time in the recent past, or

what will occur in the far future by what has occurred in late years, what an opportunity is here! In the space of one hundred and seventy-six years the Lower Mississippi has shortened itself two hundred and forty-two miles. That is an average of a trifle over one mile and a third per year. Therefore, any calm person, who is not blind or idiotic, can see that in the Old Oolitic Silurian Period, just a million years ago next November, the Lower Mississippi River was upward of one million three hundred thousand miles long, and stuck out over the Gulf of Mexico like a fishing rod. And by the same token any person can see that seven hundred and forty-two years from now the Lower Mississippi will be only a mile and three-quarters long. There is something fascinating about science. One gets such wholesale returns of conjecture out of such a trifling investment of fact."

Relative Risk vs. Individual Risk Reduction

Which newspaper headline is likely to get more attention:

"Yearly Stool Test Reduces Colon Cancer Deaths By 33 Percent"

"Yearly Stool Test Reduces Your Chance Of Colon Cancer Death By Less Than 1 Percent"

Both are accurate statements from a very large study (46,551 participants), but one speaks to relative risk reduction while the other covers individual risk reduction.¹⁰ In the group that received annual screening for blood in the stool, 2.6 percent died of colon cancer, while in the group that did not receive annual screening for blood in the stool, 3.4 percent died of colon cancer. The relative risk reduction was 33 percent.

Estimating Your Individual Risk Reduction*

Difference Between:	Relative Risk Reduction	Your Risk Reduction
1% and 2%	50%	1%
2% and 3%	33%	1%
9% and 10%	10%	1%
5% and 10%	50%	5%
10% and 20%	50%	10%
20% and 40%	50%	20%
* From Murphy, reference 10.		

However, the individual risk reduction, e.g., the difference between 2.6 percent and 3.4 percent is 0.8 percent. Therefore, the chance that annual screening for blood in the stool will prevent you from dying of colon cancer is less than 1 percent. Clearly, the headline that suggests a 33 percent reduction will get the attention.

Murphy states, "The medical profession and the media advertise relative risk reduction and not individual risk reduction, and no matter how sophisticated the research project and statistics may be, interpretation of the data can vary."¹⁰ The accompaning table provides help in showing the difference between relative risk reduction and individual risk reduction. *P&SF*

References

- 1. Rex Stout quoted in Steven. J. Milloy, Junk Science Judo, Cato Institute (2001)
- 2. Joel Best, *Damned Lies And Statistics*, University of California Press (2001)
- 3. John. A. Paulos, *Innumeracy*, Hill and Wang (1988)
- 4. D. Murray, J. Schwartz and S. R. Lichter, *It Aint Necessarily So*, Rowman & Littlefield Publishers (2001)
- 5. John A. Paulos, *A Mathematician Reads The Newspaper*, Anchor Books (1995)
- 6. R. Doyle, *Scientific American*, 284, **26** (May 2001)
- 7. Christopher Murray quoted in R. Malan, "Megadeath and Megahype," *San Francisco Chronicle*, D1 (January 6, 2002)
- 8. "Missing America." *Time Magazine*, 155, **22** (April 3, 2000)
- 9. Mark Twain, *Life On The Mississippi*, Harper & Row (1874)
- 10. D. J. Murphy, "Honest Medicine," *The Atlantic Monthly Press* (1995)

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