

MATHEMATICS AND STATISTICS

BY JAMES D. NICKEL

Mathematical statistics is the study of ways to analyze data and the inferences drawn from this examination. Although ancient civilizations did gather and tabulate data, Carl Friedrich Gauss (1777-1855) was the first to develop the methods of statistical inference. These tools enable the mathematician to investigate data sets that are too large or too complex to understand comprehensively. Statisticians take random samples the given data set and use statistical laws to derive inferences from these samples. They then *qualify* their conclusions using margins of error or confidence intervals.

The object of statistics, as a tool of dominion, is to discover methods of condensing information concerning large groups of associated facts into a brief summary that is suitable for discussion and decision-making.

These methods can be misused in order to infer virtually anything (based upon the biases of the one making the study). You can make statistics *say anything you want it to say*.¹ Although the following, entitled “Penetrating the Rhetoric”² is an analysis of the rhetoric of political ideologies, it serves as a benchmark for the analysis of any type of argument, especially those arguments that rely upon statistics.

1. All statements are true, if you are free to redefine their terms.
2. Any statistics can be extrapolated to the point where they show disaster.
3. A can always exceed B if not all of B is counted and/or if A is exaggerated.
4. For every expert, there is an equal and opposite expert, but for every fact there is not necessarily an equal and opposite fact.
5. Every policy is a success by sufficiently low standards and a failure by sufficiently high standards.
6. All things are the same, except for the differences, and different except for the similarities.
7. The law of diminishing returns means that even the most beneficial principle will become harmful if carried far enough.
8. Most variables can show either an upward trend or a downward trend, depending on the base year chosen.
9. The same set of statistics can produce opposite conclusions at different levels of aggregation.
10. Improbable events are commonplace in a country with more than a quarter of a billion people.
11. You can always create a fraction by putting one variable upstairs and another variable downstairs, but that does not establish any causal relationship between them, nor does the resulting quotient have any necessary relationship to anything in the real world.
12. Many of the “abuses” of today were the “reforms” of yesterday.

There are three kinds of lies: lies, damned lies, and statistics.

Benjamin Disraeli (1804-1881)

Statistics is a group of numbers looking for an argument.

Anonymous

In order to evaluate the reliability of any statistical study, one must ask two questions:

1. Was the sample taken both random and representative of the data set?
2. Are the conclusions qualified by margins of error or confidence intervals?

We must brace this branch of mathematics a Biblical Christian ethic. This ethic furnishes a standard for honesty in: (1) revealing all pertinent assumptions regarding the data to be sampled, (2) measuring the data,

¹ See Darrell Huff, *How to Lie with Statistics* (New York: W. W. Norton, [1954, 1982] 1993).

² Thomas Sowell, *The Vision of the Anointed: Self-Congratulation as a Basis for Social Policy* (New York: Basic Books, 1995), pp. 102-103.

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(3) reporting the data, and (4) following the basic mathematical principles of statistical inference when stating the conclusions drawn from the data. Without these ethical standards, this discipline will run amuck. Scripture warns:

Diverse weights and diverse measures, they are both alike, an abomination to the Lord (Proverbs 20:10).

You shall do no injustice in judgment, in measurement of length, weight, or volume. You shall have honest scales, honest weights ... (Leviticus 19:35-36).

In the essay "Two Ways of Knowing" (Calvin College: 2004), Professor James Bradley connection statistics of inductive reasoning:

We all use inductive reasoning frequently. The difficulty with induction, however, is that it provides no guarantees of the correctness of the principles we infer; it always involves an "inductive leap" from the specific cases we have observed to a general principle we cannot directly observe. So it is very easy to err in using induction. Statistics is a systematic method for carrying out inductive reasoning. It helps us identify and avoid common errors people make in reasoning inductively; furthermore it helps us assess how much confidence we can have in the general principles we induce. So statistics is not something new or foreign to our thinking; rather, it is a refinement of something we all do naturally.

As long as one heeds the warnings and qualifications documented in this essay, the Biblical Christian can embrace the study of statistics as a tool that sharpens the knife of inductive thinking.

If a man stood with one foot in a hot oven and the other foot in a freezer, statisticians would say that on the average he was comfortable.

Quote Magazine (29 June 1975)

Do you know that 87.166253% of all statistics claim a precision that is not justified by the method employed?

Anonymous