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The Disparagement of Statistical Evidence

No one would claim that the theory of probability and that great body of statistical theory and practice which is based upon stochastic concepts are easy subjects, either technically or philosophically. The mathematical requirements are considerable, and the reasoning is often subtle.

But the basic procedures by which one treats the necessarily discordant results of any experiment or set of observations, and by which one calculates the degree of confidence justified by the combined result —these procedures are by now well developed, widely accepted, and competently known by any person with the requisite training.

Since the techniques of statistics are complicated, powerful, and not understood by the general public, there is always the chance of misuse. We remember with a shudder the clumsy enthusiasm with which correlation coefficients were seized upon, years ago, by many who wished to create an illusion of scholarly and scientific competence. And even today almost every big national magazine casts about to find a "statistical index" which "proves" that it has the most to offer to advertisers. It is not surprising that a clever and amusing book has been written under the title *How To Lie with Statistics*.

It must also be agreed that the statistical evidence which results from carefully designed experiments provides a much more solid foundation for inference than does statistical evidence which is, so to speak, merely "gathered."

All this is understandable. But it is shocking to note that various groups, in order to shake public confidence in statements which they find uncomfortable, are taking the position that it is silly to be impressed by evidence that is "only statistical."

For some time the outstanding offenders have been persons associated with the tobacco industry, who have claimed that the evidence for the relation between cigarette smoking and lung cancer is *only statistical*, as though that indicated a fancy and unreal sort of argument, which certainly would not affect down-to-earth persons.

But others are now taking similar attitudes towards statistical procedures. In a current news article I read that "the research directors of the Republican and Democratic campaigns say that . . . we find the statistics and then discount them."

It is, of course, possible that the polls in question were not competently planned, conducted, or interpreted. But it is essentially antiintellectual to indicate a blanket condemnation of statistical evidence.

Science recognizes the basic and the pervasive role played by probability and statistics. It is through a probabilistic procedure that every indvidual obtains the set of genes which to so great an extent determines what he is. The processes of communication, we have learned in recent years, are essentially statistical in nature. And on the broadest possible scale, our knowledge of the world about us is, in the present view, strictly and inevitably statistical in character.

For the individual behavior of every elementary particle in our universe is governed by laws which can only be expressed in probability terms. Everyday gross phenomena are normally predictable simply because of the vast numbers of individual events involved, the statistics thus becoming "regular" and dependable, just as is the experience of an exceedingly large life insurance company.

The automatic discarding of evidence because it is statistical is unscientific and wholly unwarranted. Statistical evidence is, in essentially all nontrivial cases, the only sort of evidence we can possibly have.—WARREN WEAVER, *Alfred P. Sloan Foundation, New York*