Comment

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Chatfield provides a valuable service by reminding us of many of the problems associated with statistical analysis. Computational tools have freed statisticians from the burden of arithmetic. Now, most of their talent can be focused on the broader and more important aspects of analysis.

These are matters of scientific taste, reflecting the experience and character of the statistician. We can expect different approaches, different methodologies from different analysts. Some will be more effective, more successful, than others. In this, statisticians are subject to the same variation in viewpoint as any other group. Thus, while agreeing with Chatfield's goals, I would add two others: simplicity of methodology and limiting the amount of analysis.

Statistical science is viewed as such: as a science. And most people believe that all science is in some sense objective, that statistics should share this characteristic, that there is a correct statistical analysis. Popper and others point out the pivotal, nonobjective role of inspiration and experience in all of science. Chatfield's article clearly illustrates this for statistics. The article emphasizes the necessity in analysis for an understanding of the underlying problem and of the measurement process. This understanding is incorporated in the strategy of analysis selected. This process involves choices made by the statistician.

There remains, however, the goal of statistical analysis: to present data in such a way that most readers will believe the conclusions drawn. This approximate unanimity can be achieved more easily when the measurement process and the analysis is kept exceedingly simple. The force of a conclusion is roughly inversely proportional to the complexity and number of the methods used to exhibit it. For this reason, the simplest possible techniques should be used.

Statisticians often face a researcher with a collection of data, a long list of questions to be addressed and a long list of procedures to be used. The answer given to Chatfield's question, "What is your overall objective?" is often a surprising number of hypotheses to be tested. But, in any collection of data, there is typically a substantial amount of noise but only a very limited amount of information. For this reason it is important that the analysis be focused on using the available data to shed light on the most important question. The statistician can play an important role by having the investigator give priorities to his questions, to decide what is the most important. This winnowing of goals is often long and difficult. (I ask researchers, "How many significant effects does it take to win a Nobel prize?") Once the primary objective has been addressed, secondary questions can be entertained if they still seem important.

Chatfield emphasizes the value of graphical display of the raw data. There is typically a one-to-one relation between an appropriate display of the raw data and a simple and convincing analysis. Indeed, most readers will not need be greatly influenced by a calculated p-value when such a display is given, although the omission of this will be judged to be unscientific.

I have known only a few cases where significant effects were found for which the corresponding display, clearly demonstrating this, could not be produced. I have known only a few cases where significant effects were found for which a simple t-test did not establish the significance. In such instances, more sophisticated methods serve only to satisfy those with a curious delight in complexity.

Chatfield's article is a valuable contribution to the most important but least spoken-of aspects of statistics. While I share his concerns, I would do some things rather differently in ways that would not matter much. I would however encourage the reader to avoid associating statistical analysis with pitfalls. Statisticians should be proud of the important contribution they make to investigations. Statistical collaboration and consulting is not a slippery path with disasters lurking at every turn, but a constructive, stimulating and satisfying activity that brings the practitioner in contact with the most imaginative characters of every sphere working on what they believe is the edge of human understanding. For some of us, this appeal is irresistible.

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