

IS ANYONE LISTENING OUT THERE? STATISTICS AND THE PUBLIC

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The teaching of statistics from kindergarten to graduate university levels is of great importance, and everyone here is concerned with aspects of that teaching. The present talk deals with a less structured side of our statistical outreach: presenting statistical thinking to the several great publics that are out there beyond the classroom and beyond formal education. What of statistics can we transmit to nonstudents in legislatures, courts, factories, the military, the nursery, and so on? How to transmit it?

That outreach is important not only for its own direct sake; it also is important indirectly, for, in one way or another, the broad publics out there strongly influence what is done statistically in schools and colleges.

I have three broad themes. First, I discuss the natural desire of statisticians to be understood and encouraged by society at large. (Along with that, I discuss parallel natural desires by other groups.)

Second, I make suggestions about kinds of statistical lessons for the public . . . which differ from statistical lessons in school.

Third, I end with a speculative analysis of the unfortunate near-absence of song, story, and rousing myth that might underlie statistics.

Explaining ourselves. If we begin to think about attempts of statisticians to explain statistics to general publics, we are soon led to consider similar efforts by chemists, psychologists, lawyers, physicians, city managers, insurance agents, and so on. Where to stop in comparative analysis? Everyone – well, almost everyone – wants to be admired and understood for activities helpful to society.

Organizations quickly come to play important institutional roles in these efforts for recognition. For example, the International Statistical Institute, the American Statistical Association, the Institute of Mathematical Statistics, and all other statistical societies I know, have organized efforts explaining our profession and its importance.

Cross-disciplinary groups, like the National Science Foundation and the National Academy of Sciences, ask about public attitudes towards, and knowledge of, science generally. What can be done to improve those attitudes and extend that knowledge?

Surely all human groupings compete for public comprehension and attention. That competition provides both models for what a professional or other group can do, and simultaneously a discouragement: with all those

claims for attention, how can statistics – with its sober practitioners and dry reputation – hope to be adequately heard?

There are at least three reasons for statisticians – or others – to communicate with wider publics. First, there is citizenship, and our knowledge that statistical thinking is essential to the formation and execution of public policy. An example is the activity of statisticians in connection with undercount problems of the census.

Second is the narrower motive of seeking support and resources, from funding research to student assistance.

Third, is the almost universal desire to be understood and loved. No doubt most of us have worked hard explaining statistics to parents, spouses, children, and so on; it is not so wide a jump to seeking appreciation by relatively remote publics.

We certainly are sensitive to lack of understanding and affection. The Royal Statistical Society's News & Notes in 1976, for example, reported upsetting comments by the Duke of Edinburgh to the Royal Society of Arts. He said, in part, that ". . . quantification has created a fetish for statistics which has spilled over into field which used to depend upon judgment . . . Counting heads . . . , working out averages and percentages . . . , predicting trends from computerized intelligence now tends to become the substitute for humane government . . . "

The UK's Royal family is, I suppose, a special public for whose statistical education the Royal Statistical Society has special responsibilities. Perhaps in the ten years since 1976, the Duke has come to a more accurate understanding of statistics.

On this side of the Atlantic, the American Statistical Association has long worried about the above three important questions of communication with wider publics. One resulting set of activities have been those of the Joint Committee on the Curriculum in Probability and Statistics; a committee both of ASA and the National Council of Teachers of Mathematics. Its initial chairman was Frederick Mosteller, and later chairmen include Robert Hogg, Jim Swift, and Richard Scheaffer.

One of the efforts of the Joint Committee led to publication of Statistics: A Guide to the Unknown. That book of mostly non-technical essays on successful applications of statistics was intended for a wide audience, especially an audience of parents, teachers, and the general public that – after all – pays in one sense or another for schooling. With generous help from the Sloan Foundation (theme 2), the book's essays were widely drawn: polio vaccine field trials, whale populations, opinion polling, baseball. And so on. A thoroughgoing revision is now in process, and we hope that it will reach a still wider public.

A different ASA activity, also in a way addressed to wide publics, is the hope for an ASA building in Washington, DC, a building from which, so to speak, a statistical flag may be furled in the nation's capital. Perhaps such

a symbol would help to correct the all-too-frequent Prince Philip view of statistics as an anti-humane technicality.

ASA has many other related activities, a number of them suggested by its Committee on Future Goals. In 1983, that Committee recommended establishment of a public affairs office, radio and television shows, a speakers' bureau, and other such good works. Of course such initiatives are difficult to carry off well, with dignity and efficiency. They seem to be coming closer to fruition.

On a wider geographical scale, I salute the International Statistical Institute for these ICOTS conferences and of course for other healthy reach-out actions. Let me cite the 1985 Atkinson-Fienberg book, A Celebration of Statistics/The ISI Centenary Volume; it is in part explicitly "for laymen and for our colleagues in other professions."

Mathematical organizations also engage in such reachings out, as do our friendly sociologists, anthropologists, meteorologists, etc. Even some austere economists worry about the public standing of their profession. I have sought, but not found, a systematic cross-cutting study of these love songs from professional groups to the public.

Broadly based scientific organizations share concerns about the public. For example, the U.S. NSF's Advisory Council recently recommended to Director Erich Bloch that the Foundation work toward better indicators of scientific progress, that it encourage more participation by scientists in public policy processes, that it create stronger links with journalism, radio, and television, etc. etc.

Two cautions come to mind. First, how might one – even in principle – evaluate such programs of outreach to the public. Second, look into one's own heart and mind: to what extent do we, as statisticians, ourselves attend to reach-out programs for chemists, theologians, veterinarians, historians, and so on? To ask that question is to invite despair, for no one has time to listen to any but a tiny fraction of all the messages coming in from every side.

Yet do not despair. It is essential to carry on, but without naive ideas of what can be achieved. We must swallow hard, but continue to reach toward wider publics. The alternatives are far less promising.

What should the messages be? As already outlined, our messages relate to the importance of statistics to society and the successes of statistics in dealing with interesting, important problems. At the moment, however, I want to suggest a few more specific themes. What are the truly essential ideas of statistics, to be expounded in attractive, concrete, yet not distracting, narratives.

So I would stay away from anything the least bit technical: Student t tests, normal distributions, mean square errors, confidence intervals explained . . . all such important topics I set to one side for present purposes. You may ask what is left, and I illustrate briefly a few of the remaining fundamental ideas.

First is the idea of pervasive variability, coupled with pervasive error in observation, calculation, and logic. There is, to be sure, a basic tension here. If we pay adequate attention to variability and error, we may seem uncertain, tentative, and vacillating. Our command presences will be tattered; small wonder that statisticians have an ambiguous reputation.

On the other hand, despite variability and error, we really do know about finding genuine patterns in cloudy data. That is the central positive point.

Another fundamental idea is that of the sample telling us about the population. The representative sample concept is indeed ambiguous, yet it is important and fruitful. Statistics has to a large extent untangled the separate strands of the concept and put them to effective use.

Somewhere I would include the intuitive idea behind hypothesis testing, but without the slightest hint of technicalities.

Randomization is also truly basic, yet a shade too technical for present purposes. Other aspects of good design practice are readily described and deserve to be on the list: control groups and double blindness.

Statistical heroes and heroines. At an emotional level welling up from deep inside, the ultimate difficulty in our relations with broad publics is the absence of any tradition of the statistician as hero, as protagonist, as a two-gun sheriff coming to town to clean out those bandits who glory in tententious bias and misleading graphs. The statistician as Hamlet would be more practicable, but I know few examples.

Medical research has its Arrowsmith, but where is the Sinclair Lewis to dramatize statistics for millions of readers? The Odyssey confirmed public recognition for sailors, adventurers, and those who stayed home at the loom. What Homer will sing the glories of randomization?

Prometheus brought fire to mankind and has been amply celebrated, although his own end was tragic. Where is the creation myth about a god who brought number to man, number and observation and data analysis?

Most literary references to statistics are slighting, like Dickens's description of Bob Cratchit, meek and mild, with a green eyeshade and high stool, doing Scrooge's accounts – surely a kind of statistics – as a thoroughgoing non-hero. Again, consider Trollope's caricature of Wallachia Petrie, an American bluestocking. She defended a ludicrous sort of statistics, ". . . about two out of every five Englishmen can read a book. Out of every five New Englanders four and four-fifths can read a book . . . I cannot conceive how you are to learn anything . . . except by statistics."

In low-brow culture, statisticians are even more distorted or absent. Where was the statistical Buck Rogers in the comic strips of my childhood? To be sure, there are intrinsic reasons. How can you have a Wonder Woman if she is worrying about expected losses of decision functions, or a Daddy Warbucks who frets about magnitude of observational error?

Still there may be a few precedents on which to build. The best example I know is Ford Madox Ford's novel, Some Do Not . . ., published in 1924, and acclaimed in literary circles but, I fear, not widely read. Ford's protagonist is indeed a statistician – an economic statistician – and in the plot figure prominently two struggles with political forces that press for distortion of the numbers for international propaganda purposes.

Thus I hope that forms of literature and art will increasingly make the public more sensitive to statistical issues and approaches, so that our basic messages may more readily be communicated. There is willy nilly, a market place of disciplines and professions competing with each other crassly for resources, and idealistically for opportunities to serve. Schoolroom teaching is central for us in supporting the role of statistics, but also central should be our deepening of statistical understanding by the adult population.