Statistical Science
2011, Vol. 26, No. 1, 17–18
DOI: 10.1214/11-STS337B
Main article DOI: 10.1214/10-STS337

Discussion of "Statistical Inference: The Big Picture" by R. E. Kass

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Rob Kass presents a fascinating vision of a "post"-Bayes/frequentist-controversy world in which practical utility of statistical models is the guiding principle for statistical inference. I agree with Kass on many points. In particular, Kass is correct (in my opinion) when he notes that much modern statistical work develops statistical models (the theoretical world) and asks whether the models provide a reasonable description or explanation of data (the real world). A recent example in my own collaborative work (Scharenbroich et al., 2009) builds a storm tracking model that combines subjective information from climate scientists about storms in the eastern Pacific and historical data to develop a probabilistic model that appears to fit data well. A critical element of this approach, as Kass notes, is that we understand the assumptions that underlie our statistical model and, equally important, that we subject these assumptions to careful scrutiny. I continue to find posterior predictive model checks (Gelman, Meng and Stern, 1996) especially helpful for assessing model fit.

Of course, this would not be a particularly interesting discussion if it focused on points of agreement. I believe that Kass's proposed "big picture" fails at one key goal that we should have for such a picture—it does not easily illustrate one of the key concepts of the field, the art of generalizing from sample data to larger populations. I argue below that the "old" big picture (Kass's Figure 3) still has great value for me and for the field. I also speculate a bit about pragmatism as a foundation on which to build a training program for statisticians.

IN DEFENSE OF THE "OLD" BIG PICTURE

My main disagreement with Kass concerns his dissatisfaction with his Figure 3 and the story that it tells. According to Kass, the figure, which describes inference as drawing conclusions about a population from a sample of that population, "is not a good general description of statistical inference"; he prefers his Figure 1. When it comes to teaching introductory students, I much prefer the old figure. The statistical or quantitative literacy that I would love for my introductory students to develop (and bring into the world with them) does emphasize statistical inference as the process of learning about populations from samples. Understanding the importance of the inference question posed in this way will help non-statisticians ask whether a study of memory in college sophomore psychology students provides sufficient insight to allow one to generalize to the U.S. population as a whole or whether a medical study associating a particular risk factor with disease is based on a sufficiently representative sample. When I meet with scientists on campus the starting point is not the methodology but the scientific question and how to design a study that will inform about that question. The question of how to obtain representative data is an important one and many studies suffer when insufficient attention is paid to this basic point at the start of a study. When I am asked about statistics by people outside the University, ranging from middle school and high school students to my in-laws and the occasional taxicab driver, I tell them about how we use samples to learn about populations rather than about building theoretical models of the real world.

The "old" big picture (Figure 3) is also an accurate reflection of the world of survey sampling which plays a major role in the collection of data that drives public policy. Survey sampling may not be a major part of the statistical toolkit for the scientific collaborations discussed by Kass but it remains a critical function of the discipline. I would prefer future politicians learn about survey sampling and statistical inference from the traditional picture than about alternative binary regression models from the new big picture. Just this summer the Canadian government proposed making their Census long form optional—I would sure like for people to easily grasp why that is problematic. I believe they would see the problem from Figure 3 or at a minimum that the problem is easily described by referring

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