

# Letters to the Editor

Meng, X. (2009), "Desired and Feared—What Do We Do Now and Over the Next 50 Years?" *The American Statistician*, 63, 202–210.

I have a different perspective on Xiao-Li Meng's excellent article. Meng is right that the profession is both desired and feared. However, I think we have to work to get it acknowledged, understood, and appreciated. Meng has some excellent suggestions concerning the new crop of statistical trainers. I have a greater concern about the new crop of non-statisticians.

As the chief statistician of the U.S. Environmental Protection Agency, my colleagues are overwhelmingly non-statisticians. They are economists, scientists, information technologists, lawyers, engineers, and policy makers. I would love these non-statisticians to acknowledge that data analysis requires a proper statistical perspective, to understand the difficulties and incorrect conclusions that can be reached without it, and to appreciate the advantages of dealing with a statistician early in the process. In my experience the bureaucratic method to require such collaboration with statisticians is precisely and ironically the method that will guarantee failure. That is, we will *not* be successful if our method is to *mandate* some type of "statistical sign-off" for major projects. Meng is quite correct that, "... a statistician's name in the authorship list is the most effective way of fending off non-statistical reviewers' questions of the validity of the analysis." Of course, the same is true in a non-academic environment. All too frequently the statistician is asked for a review of the results, not necessarily to provide comments and offer suggested improvements, but to simply be the "sign-off," thereby relieving other reviewers of the statistical burden. Further, with probability close to 1, this request for review occurs when it is far too late to make vital changes in the basic design.

So if that method does not work, how do we do this? The trick is to have basic training in "empirical reasoning." The word "statistics" doesn't even have to be explicit. Meng recounts that Harvard considered this, but only agreed to a diluted version. Reflecting on this result, I noticed the September 5, 2010 New York Times opinion piece by noted economist N. Gregory Mankiw, also of Harvard. Mankiw suggests what students of all ages should learn is some economics, some *statistics*, some finance, and some psychology. While I certainly agree with Meng that the trainer should have a profound pedagogical passion with great communication skills, I am not quite as concerned as Meng *who* the teacher is. While I certainly would love only the best and the brightest to teach the younger generations, I don't quite agree with Meng's somber concern that "statistics will be greatly diluted and devalued when it allows many unqualified people ... to educate future generations." In fact, I could easily see a situation in which a minimally qualified, but at least honest, trainer would acknowledge his or her limitations to the class and use that as a lesson to get the advice of a trained statistician.

Here at EPA, we do teach basic statistical concepts to non-statisticians with surprisingly good results. We use the phrase "teaching the concepts, not the formulas" to alleviate most of the fear of the attendees. The result has been a cadre of employees who now use statisticians as part of the team early and often in the analyses. Perhaps, this is analogous to Meng's happy course, but he concentrates on developing future statisticians. We concentrate on the non-statistician. Incidentally, while teaching these courses, on more than one occasion, we have been approached at the coffee break and asked "if we are real statisticians?" Apparently, real statisticians can't communicate and can't be humorous. That perception is yet another problem.

While we may have a different target audience, I totally agree with Meng's assertion that the "real issue here is how to elevate our general pedagogical effort so that many more people can appreciate statistical thinking in real terms ... whether they would be labeled as statisticians or not."

Barry D. NUSSBAUM  
U.S. Environmental Protection Agency

## Response

As the chief statistician of the EPA, Dr. Nussbaum has been at the forefront of statistical applications for decades. I therefore particularly value his emphasis on statistical training for non-statisticians, an issue discussed repeatedly in my original article, especially regarding designing and offering Subject Oriented Statistical (SOS) courses for subject specialists (Section 4) and "Happy Courses" for general education (Section 5), as well as helping non-statisticians to "self-police" (Section 8). I also had the great pleasure of hearing his "... And Then I Told the President ...," a guest lecture for the election module of my "Happy Course" in the Spring of 2010. The students in that course came from 14 different concentrations (aka, majors): *African and Africa American Studies, Anthropology, Computer Science, Economics, English, Government, History, History and Literature, History of Art and Architecture, Human Evolutionary Biology, Molecular and Cellular Biology, Psychology, Social Studies, and Visual and Environmental Studies*. The vast majority of them will never become professional statisticians or even amateur ones, nor is it the goal of the course to provide such a training. The guiding principle of "Happy Courses" is that one can learn to appreciate wine without knowing how to make it, a philosophy I believe that also underlies Nussbaum's "teaching concepts, not the formulas."

Incidentally, I received Nussbaum's letter shortly after submitting the abstract for the 2011 ENAR Presidential Invited Address, where I will attempt to explore the issue of prioritizing our very limited resources relative to the tremendous demands and tasks we face for the foreseeable future. This abstract summarizes my current thinking on statistical training and collaboration, which touches upon the very issues Nussbaum raised regarding statisticians' roles in providing "statistical sign-off" and training for non-statisticians. Coincidentally, it also echoes Nussbaum's incidental point on statisticians' humor. I therefore ask the readers' indulgence for the inclusion of this abstract in its entirety, and take it as an invitation to join Nussbaum and myself on our expedition into the Statistical Future Land (with a stop at Miami Beach on March 20–23, 2011).

### "Generalists and Specialists: A Contemplation of the Vitality of Statisticians via Paradoxes"

Statisticians are being desired and feared (Meng, Aug. 2009 & Feb. 2010, *The American Statistician*). The demand is such that trying to train enough qualified statisticians to meet the need is a losing battle in the foreseeable future. A viable alternative is to direct more of our pedagogical efforts at—or even before—the undergraduate level, taking on the task of being the first and most formative quantitative trainers for future scientists, policy makers, educators, etc. That is, collectively we can aim to be "educational generalists" or rather "general education-alists," delivering "preventive medicine" by raising the general level of statistical literacy and hence helping to reduce the need for specialists. At the graduate level and beyond, we should focus more on producing statisticians who can address complex problems that require the type of deep thinking, principled methods, and rigorous analysis for which our discipline has a longer history and firmer foundation than many others. As a trade-off, this strategy may lead to more reliance on other fields to provide "outpatient clinics," again using a medical metaphor. But given that a trade-off has to be made, it is more vital for us to strengthen our reputation as "specialists" whom "outpatient clinics" will refer to when a problem cannot be handled routinely or when an expert's opinion is critical in either delivering peace of mind or deciding the next step. In other words, our vitality lies in quality, not necessarily in quantity.

Both are long-term tasks that require collective and sustainable efforts, as well as high standards for ourselves. Constant self-examination is crucial for maintaining our credibility both as education generalists and research specialists. Without it, for

example, we could be fooled on a grand scale by the off-diagonal paradox in assessing the effectiveness of AP Statistics (Meng, Dec. 2009 & Jan. 2010, *Amstat News*), or by Simpson's paradox in quantifying health disparities (Duan, Meng, Lin, Chen, and Alegria, 2008, *Statistics in Medicine*). Both examples illustrate what our profession can offer as education generalists and research specialists, when we hold a high bar for ourselves. [To reduce the potential stress caused by holding a high bar, the talk will also take a detour to a different kind of bar by offering a glass of intoxicating "Happy Statistics" (Meng, Sep. 2009, *Amstat News*).]

Xiao-Li MENG  
*Harvard University*

**Aldous, D., and Phan, T. (2010), "When Can One Test an Explanation? Compare and Contrast Benford's Law and the Fuzzy CLT," *The American Statistician*, 64, 221–227.**

In preparing a revision of our article "When Can One Test an Explanation? Compare and Contrast Benford's Law and the Fuzzy CLT" (*The American Statistician* 64 (2010), 221–227) we relied both on reviewers' comments and (for Section 3.3: "Background to Benford's Law") on personal communications from Ted Hill. In particular, Hill provided the  $U[0, T]$  example that contradicts a literal interpretation of the cited comments of Feller (1966).

Sincerely  
David ALDOUS  
Tung PHAN  
*Department of Statistics  
U.C. Berkeley*