

May 27, 2003

James Albert, Editor
The American Statistician
Department of Mathematics and Statistics
Bowling Green State University
Bowling Green, OH 43403
U.S.A.

Dear Dr. Albert

Please consider the attached manuscript "*A New Way to Display Collections of Likelihoods and Distributions: the Raindrop Plot*" by myself and my co-author Ransom A. Myers, for publication in *The American Statistician*.

In May of 2000, we submitted an earlier version to the former editor, Lynne Stokes. In November of 2000, Dr. Stokes sent me reviews from an Associate Editor and two referees. I have enclosed a copy of the original paper and the entire correspondence from Dr. Stokes for your reference. Unfortunately, at the time I had just completed my Ph.D. and was just starting a new position, and the paper fell by the wayside.

Dr. Stokes wrote that

"... the current version is not suitable for publication yet ... The most important change we request is that you include discussion of what is learned about the data from your plots that would not have been learned (or would have been harder to see) without them."

To this end, my co-author and I have extensively overhauled the manuscript. The title and emphasis have been changed, one of the examples has been modified to better demonstrate the advantages of our new display, and the discussion has been revised. We have revised several figures and added a new one. To save space, we deleted the old Figure 2 and some related text (we would be happy to put it back in if requested.) Beginning on the next page, we have given point-by-point responses to the reviews, noting the changes we have made.

We believe that the resulting paper is much stronger and more streamlined. The raindrop plot has already been used in several published works (**refs?**), and we believe that it is a useful tool for studying and displaying collections of likelihoods and distributions. We look forward to the opportunity to share the method with the statistical community.

Sincerely,

Nicholas Barrowman

Response to Reviews

Belatedly, we would like to thank the Associate Editor and the two referees for their helpful reviews of our manuscript.

Both the Associate Editor and Referee #2 requested more interpretation of the raindrop plots to show how they enhance understanding. We concluded that a stronger example would help to demonstrate the value of raindrop plots. In our coho salmon example, we therefore replaced the Beverton-Holt spawner-recruitment model with a “logistic hockey stick” model that we introduced elsewhere (Barrowman NJ, Myers RA. *Can J Fish Aquat Sci* 2000; 57:665-676.). This model leads to likelihoods with multiple modes which are not evident in traditional “point-estimate-and-error-bar” displays.

The following are responses to the other points raised by the Associate Editor and the referees.

Associate Editor

I encourage the authors to extend the discussion of each example to include how the plot should be interpreted and what conclusions can be drawn from the plot and what is learned that was not learned by previous analysis.

We have added such discussion at the end of each example, focusing on interpretation and conclusions from the raindrops.

Section 6 of recommendations needs to be moved forward. I found myself wondering about the different shading on the raindrops when looking at Figures 3 and 5 but this shading was not described until Section 6.

We have embedded the recommendations earlier in the text (in the ulcer studies example.)

Section 2 shows standard formulas for log odds ratios. I'd suggest that this section be rewritten in terms of general data and its likelihoods and not be constrained to one particular type of data. The raindrop plot is not only for displaying likelihoods of log odds ratios but is for general data summaries and should be presented in this more general context.

We have abbreviated the standard formulas in this section and emphasized the generality of the method.

Referee #1

The fourth sentence in the abstract is confusing.

We are grateful to the referee for catching the error in the (rather tangled) wording of the fourth sentence of our abstract. We have amended the wording.

It would be more consistent and informative to use 95% and 99% HDR raindrops overlaid as the authors have done for the likelihood-based regions, and as Hyndman (1996) proposed.

Not sure about this one.

The use of normal-based intervals in Figure 5 seems inappropriate given the arguments against such intervals in the rest of the paper.

We agree. In our new version of this figure (which now involves a different model), we show likelihood-based intervals alongside the raindrops. This provides a fair comparison, and allows us to explicitly highlight the advantages of the raindrops.

Referee #2

In Section 4, on p 5, the authors say, “In the analysis of the ulcer data, the MLE-prior raindrop shows a somewhat subtle deviation from normality.” If it’s important that users be able to detect subtle deviations, or perhaps even not-so-subtle deviations, they may need extra visual cues. For instance, it might be helpful to include a reference normal raindrop in each plot, or to offer a version of the plot in which deviations from the normal were highlighted.

Following the referee’s suggestion, we have added a figure (Fig. 4) showing reference HDR raindrops. We believe this will help readers judge deviations from normality in both the ulcer example and the coho salmon example.

I’d like to ask the authors for more interpretation of their plots. In section 4, could the authors point more clearly to some insight revealed in their plot that wouldn’t be visible if the second dimension were absent?

As noted above, we have expanded the interpretation of the plots. In the ulcer example (originally in section 4), we focus on the “ramping” behaviour of some of the likelihoods and on the shape of the HDR raindrop for Efron’s MLE prior.

In the Coho Salmon example, the authors say, “However the raindrops reveal an interesting difference in the shapes of the two profile likelihoods.” I suggest that they discuss how that difference is revealed, and what its significance might be.

Although the example has been changed (the model is now different), the same phenomenon manifests itself. We now give a detailed discussion of an example of such differences in shape.