

## Cases for Teaching Responsible Communication of Science

### Data mining: Diamonds or Deceit? Issues Brief

Note: Unless marked with brackets, the perspectives, arguments and opinions stated in this issue brief are those expressed in interviews with researchers in health fields. The arguments in brackets are supplied by the case authors, either on their own initiative or by drawing on publicly available commentary.

#### 1. Should post-hoc results be the abstract title and conclusion?

##### A. YES

- *Post hoc* analyses are just tests that would have established *a priori* if the researcher had thought about it ahead of time. Therefore, *post-hoc* results are just as valid as the primary endpoints.
- Don't throw the baby out with the bath water. Studies are very expensive and difficult to fund. Even if primary outcomes are a bust, you should analyze your small sample as many times in as many ways as you can to get the big bang for your buck.
- It's almost invariable that a population study group will not respond uniformly to a treatment so *post-hoc* subdivision is a necessity to fully interpret results.
- Some of these studies are millions of dollars and if we ignore results just because they were not disclosed *a priori* then it's not doing justice to the resources put into the study.
- You don't advance knowledge by hiding data; you advance knowledge by publishing it front and center.

##### B. NO

- *Post-hoc* subgroup analyses are great for developing correlations, but it's an observational analysis and should not be used in a causative frame even if it's statistically significant.
- One should be truthful and not misleading. If you've done a trial to look at the effects of X on Y but also measure Z and don't find an effect on Y, but do on Z it's misleading to title the report "effect of X on Z." The title should reflect the primary outcomes on the whole group.
- It is very difficult, if not impossible, to distinguish open data mining from those fishing for specific results to fit with preconceived conclusions (i.e data falsification).
- When you report post hoc results, too much of what was done is not disclosed (i.e how many analyses did you do, how many are you not reporting, what criteria did you use to choose which to report and which not to report?). This makes it difficult to replicate results and puts a kink in the scientific process. It's best to stick to primary endpoints.

What did the authors think? For the scientific journal abstract the authors were closer to choice (B). However, a press release about the same study was closer to choice (A). Authors of the press release, which highlighted *post-hoc* results, were found to be guilty of "willfully overstating" result conclusions, which resulted in house arrest and loss of research privileges.

2. Should an abstract title and conclusions be written for non-expert audiences?

A. YES

- Most science writers only read title and the last sentence of the abstract to see what is the take away message. And if the take away message is inaccurate or unrepresentative of the study results, then it's very misleading and can lead to a spread of misinformation.
- Even if scientists think they're talking to other scientists who will theoretically inherently understand various limitations, it's still incumbent upon the researcher to fully disclose all limitations every time in their abstracts even to their peers.
- [The researcher is the expert in the field and it is his/her interpretation of the study results that the media and public depend on to be accurate. If non-experts are expected to interpret the data on their own and ignore the researcher's conclusions then the scientist has failed at providing a key public service.]

B. NO

- Journal formats for titles and abstracts are getting to be too short for scientists to explain nuances. If you start putting a bunch of background information in for non-experts, you could miss out on explaining the key results of your study that would be meaningful to others experts in the field.
- Science results don't determine if an intervention will work for an individual, but rather if the change benefits a given population. It is the responsibility of the reader to understand the limitations of the study.
- There's no way to predict how someone will interpret your words, so your responsibility as a scientist ends with being able to support your claims with data. As long as you can make a respectable argument, you are free to communicate your work as you see fit.

What did the authors think? For the press release the authors were closer to choice (B). Like many scientists, their focus was on framing their work in the most positive light possible and garnering interest in the expanded use of the pharmaceutical of interest. It is of special note that the funding agency who authored the press release was the manufacturer of the drug being studied and thus had a strong financial interest in presenting a strong case for their product.

3. Is it appropriate to interpret data differently for different audiences?

A. YES

- If you find something new that you weren't expecting to find, then you need tell people about it. Part of the wonder of science is wonder. To say "Oh that's cool, I didn't know that before," even if contradicts a previous belief.
- People may be more conservative in papers and then become exuberant when talking to journalists. It's important to adjust your style and enthusiasm to make your work interesting and understandable for the audience at hand.

B. NO

- Because people have the ability to implement recommendations made by experts, bad science reporting can negatively impact people's lives if the conclusions being drawn are not well supported.

- Flip-flopping on positions causes confusion in the public and fosters distrust in the experts.

What did the authors think? The authors were a clear (A) on this point as the press release and journal abstract had completely different conclusions about the data. Future work investigating the drug did not support the positive claims made in the press release, and were more in line with the scientific journal interpretations. The blame for the contradictory message therefore may rest more with the drug industry who authored the press release and less with the researchers themselves.

