

# An open letter to scientific editors

## A plea for reproducibility and common sense in biostatistical reporting

Dear Editors and Colleagues,

I write this letter as a biologist and instructor of biostatistics, concerned about the disregard for statistical reporting that is threatening scientific reproducibility. I hereby urge you to spearhead the strict application of existing guidelines on statistical reporting.

As you know, the scientific community is shaken by the unanswered problem of irreproducibility, one aspect of which is the ubiquitous misuse of biostatistics in publications. Statistics serve more purposes than the sole analysis of noisy data: the statistical lexis enables an exchange of knowledge and helps communicate in a standardized manner and careless statistical reporting may endanger reproducibility. In the following, I introduce two of these mistakes that are, alas, shockingly hard to die but that you can help eradicate through simple measures.

The safe-conducts given by the editorial system to articles that do not disclose exact sample sizes are shocking. Science must be based on the possibility to repeat comparable designs, which obviously encompasses the use of similar numbers of observations. Sample sizes given as intervals (e.g. “ $n=3-18$ ”), inequalities (e.g. “ $n>3$ ”) or absurdly nebulous sentences (e.g. “ $n=4$ , *data representative of 3 rats from 2 independent experiments*”) are evident obstructions to reproducibility.

Similarly, it is perplexing to notice the proportion of publications that do not clearly reveal the statistical tests used. A clear attribution of tests must be given, including the *post-hoc* tests used after analysis of variance. It should not be sufficient to list all statistical procedures in the method section with no indication of which test was used in which figure or table.

The solution is simple: enforce rigorous policies, policies that often surprisingly exist already in your guidelines for authors. The articles you publish should clearly indicate exact sample sizes that correspond to the number of independent observations as well as the tests used in each analysis. These recommendations are inexpensive and not time or staff-consuming.

I am perfectly aware that editorial policies have improved in the past couple of years, to your credit. However, a superficial skimming through recent articles published in your periodicals on January or February 2017 suffices to notice that the bad habits I have emphasized in this letter have largely outlived all guidelines. Such flaws are unworthy of the scientific quality of your journals.

	Proportion of 10 recent (January-February 2017) articles that present the indicated flaw	
	Unclear or unknown sample size	Unclear or unknown tests
<b>Cell</b>	8 / 10	4 / 10
<b>Cancer Cell</b>	5 / 10	2 / 10
<b>Science</b>	4 / 10	2 / 10
<b>Science Advances</b>	6 / 10	1 / 10
<b>Nature</b>	4 / 10	1 / 10
<b>Nature Communications</b>	5 / 10	1 / 10
<b>J. Clinical Invest.</b>	8 / 10	2 / 10
<b>P.N.A.S.</b>	5 / 10	3 / 10
<b>P.L.o.S. Biology</b>	2 / 10	4 / 10
<b>Molecular Psychiatry</b>	4 / 10	0 / 10

Various astute suggestions have been made by others to improve reproducibility. For instance, it is essential to address publication bias, misuse of p-values, use of ridiculously small sample sizes and chronic oversight of corrections for multiple comparisons that inflates the rate of false positives...etc.

However, researchers like you and I know, that at the simple mention of such changes, protests are heard regarding the unbearable costs, in terms of money, workforce or ethics. Every scientist wants sound and reproducible science and is ready to embrace new conducts. But she/he is also justifiably reluctant to be a lonesome reformist that engages more time and money while threatening her/his chances of publication.

Unless we start by the simplest and less expensive issues enacted by collective policies, the scientific community will keep dragging their feet and all these gesticulations will be in vain.

I am mindful that, through this letter, I might eventually incur storms of protests since changes are rarely welcomed with enthusiasm. I am also aware that my non-academic affiliation might bring about scepticism. But scientific reproducibility is an enterprise important enough to outshine individual comfort.

I truly have confidence that we have a shared vision on scientific reproducibility and that you will subscribe to the content of this letter. I sincerely hope that, as editors of highly influential journals, you will take a leading role in this important transition.

Yours faithfully.

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*This letter was sent by email to the editors in chief, senior editors or editorial office of the following periodicals: Cell, Cancer Cell, Science, Science Advances, Nature, Nature Communications, Journal of Clinical Investigation, P.N.A.S., P.L.o.S Biology and Molecular Psychiatry.*

*The articles included in the table are listed here:*

<http://en.biotelligences.com/open-letter.html>