

nature

Statistical checklist

Authors providing statistical analysis in their papers are asked to check the following points to ensure statistical adequacy.

It is helpful to the editors and the referees if authors confirm in their submission and resubmission cover letters that they have applied all relevant checks from the list below to the work described in their paper.

IN THE METHODS SECTION:

Type and applicability of test used

- Comparisons of interest are clearly defined
- Name of tests applied are clearly stated
- All statistical methods identified unambiguously
- Justification for use of test is given
- Data meet all assumptions of tests applied (with particular attention paid to non-normal data sets or small sample sizes, which should be identified in the text as such)
- Adjustments made for multiple testing is explained

Details about the test

- n is reported at the start of the study and for each analysis thereafter
- Sample size calculation (or justification) is given
- Unit of analysis is given for all comparisons
- Alpha level is given for all statistical tests
- Tests are clearly identified as one or two-tailed
- Randomization procedures or other ways to eliminate bias in sampling (in particular for experiments involving animals) described
- Actual P values are given for primary analyses

Descriptive statistics summary

- n for each data set is clearly stated
- A clearly labelled measure of centre (e.g. mean or median) is given
- A clearly labelled measure of variability (e.g. standard deviation or

range) is given

- All numbers following a \pm sign are identified as standard errors (s.e.m.) or standard deviations (s.d.)

Anomalies

- Any unusual or complex statistical methods are clearly defined and explained for *Nature's* wide readership. (Authors are encouraged to use Supplementary Information for long explanations.)
- Any data exclusions are stated and explained
- Any discrepancies in the value of n between analyses are clearly explained and justified
- Any method of treatment assignment (randomization, etc) is explained and justified
- Any data transformations are clearly described and justified

WITHIN INDIVIDUAL GRAPHS:

Distortions

- Any distorted effect sizes (e.g. by truncation of y axis) are clearly labelled and justified

Clear labelling

- Error bars are present on all graphs, where applicable.
- All error bars are clearly labelled

PLEASE HELP US

Many statistical analyses published in *Nature* are highly sophisticated and outside the scope of this checklist, particularly in the case of some studies in physical sciences disciplines. Authors and referees who have specific suggestions for additional entries to this list are encouraged to send them by e-mail to authors@nature.com or referees@nature.com. *Nature* will update this checklist at intervals in an effort to ensure that papers published are statistically robust.