

MedicalBiostatistics.com

TIPS FOR THESIS WRITING AND PREPARING RESEARCH PAPERS

Initial parts of a manuscript

[Choice of TITLE](#)

[Providing AUTHORSHIP credits](#)

[Selection of KEY WORDS](#)

[Structure of the ABSTRACT](#)

Main body of the report

[Contents of INTRODUCTION](#)

[Describing the METHODS](#)

[Stating RESULTS](#)

[Writing DISCUSSION](#)

End features of a report

[Ethics of ACKNOWLEDGMENTS](#)

[Framing KEY MESSAGES](#)

[Writing REFERENCES](#)

[Need of a BIBLIOGRAPHY](#)

[Contents of APPENDIX](#)

Stating RESULTS

Results section of the report states what has been found. It mirrors your research questions, and should clearly establish the relevance of your methodology. Maintain integrity of the manuscript by stating the results in an upright manner. State not just the truth but the whole truth. For example, do not gloss over risks and side-effects of an intervention under test. Trust that scientific community is appreciative of frank statement about the negative result as much as positive result. All negative results are not failures – they save other workers to tread the same path. If there are failures, their frank admission elevates the confidence of the readers and increases the credence of results; it gives an impression that the authors are not trying to hide anything! Do not suppress findings that do not support or contradict your hypothesis.

Strive for clarity in describing the results. Opinions based on hunches or preferences, anecdotes, experience, impressions, or conflicting evidence should be clearly identified, and should be stated separately from results. Comments also should be worded as comments and not mixed with results. All results must be evidence based: fully supported by data. Any inconsistency in findings based on diverse evidence must be explained. Thus all relevant analysis must be available before results section is finalized.

Limit the results to the facts as revealed by the data. Do not try to extrapolate or generalise in the Results section. Do that in discussion section with proper explanation. Whilst the statement of the type that the difference between the treatment group and control group is statistically significant, or one treatment gives significantly higher value than the other, is appropriate for the Results section, the statement that the treatment should be preferred should be part of the Discussion or Conclusion section.

First sentence of each paragraph of Results section should indicate the contents – the point addressed or the question answered. Do not emphasise on data per se but on their interpretation. Start with descriptive results and move to the analytical results. First describe the subjects – their demographic, social and clinical features, separately for cases and controls so that the context is established. Then describe the actual findings regarding differences, confidence intervals, and *P*-values.

The trouble with most studies is that they end up with huge amount of data. You would probably analyse a wide range of data during the research and interpret it. They may all be interesting but describe in results section only those that address the research question. Examine if some of your material is better placed in appendix without interrupting the flow of the text. The mantra is to provide a holistic picture by integrating various results and present them precisely. Do not ignore any unexpected, incidental or accidental result. Use it to set the tone for future investigation. Fleming's discovery of penicillin was based on an accidental result. Also see Example 1.

Conversely, sometimes a mass of good data is available but time or expertise is not available to exploit it fully. This can particularly happen at the time of writing a postgraduate thesis for which sufficiently advanced action was not taken and it is to be submitted by a particular deadline. This is dangerous because hurrying up can lead to incomplete, even wrong conclusions.

Tables and illustrations are powerful tools. Text tell the story but tables provide the evidence and graphs illustrate the results. Include only those tables and graphs that are actually needed to support your argument. Insert them in an appropriate format and layout. Exploit their potential to effectively convey the evidence on which the results are based. Use them either as complement to text or as a substitute. For molecular photographs, do not forget to mention the magnification. For human subjects, suppress the eyes and other parts to avoid identification.

Results should narrate a story that makes sense without looking at the tables and graphs. This means that tables and graphs be referred in a sentence parenthetically such as 'treatment A was 10% more effective than treatment B (Figure X) and the difference is statistically significant ($P = 0.003$) (Table Y)'. Statements such as 'comparison of treatment efficacy is in Figure X or Table Y' are not conducive to good writing. Focus on the take-home message from the results.

Thesis, dissertation and full report obviously will contain results in much more detail with explanation of nitty-gritty of the entire data. Results in such reports should be comprehensive to cover all aspects of the problem. However, research papers for journals are considerably brief.

In the case of clinical trials and other experiments, demonstrate that the test and the control groups were comparable to begin with. Also that not many dropped out of the study. If

they did, show that the results are still unbiased. Report the adverse effects of the intervention. Consider prognostic factors where relevant. Mention about any additional intervention that had to be done in some cases because of their condition, and describe how it has not affected the validity of results. State also about efficacy, use-effectiveness, side effects observed, any unusual cases, etc.

Example 1: An accidental finding on possible role of Vitamin E in lowering prostate risk

Chase (2003) reports about a study designed to test beta-carotene for preventing lung tumours in Finnish smokers. The study found that the substance instead increases the risk of cancer. But it accidentally revealed that vitamin E could lower the risk of prostate cancer and hyperplasia. Now trials are underway to test vitamin E and selenium as preventatives.

STATISTICAL RESULTS

All mean values must be accompanied by the corresponding standard deviations (SDs). Do not give standard error because that can mask the actual inter-individual variation. Give confidence intervals where appropriate. State the name of the statistical test at the time of giving *P*-value. This test must have been mentioned in the Methods section. While stating percentages, do not forget to mention the absolute numbers also. Percentages based on small *n* can be very deceptive.

Reporting also depends on the study design. For example, for case-control study, state the number of exposed in the two groups, odds ratio, its CI and statistical significance. Give both odds ratios – unadjusted and adjusted for covariates and confounders. For cohort studies, include number of subjects with positive outcomes, relative and attributable risk – again unadjusted and adjusted. Comment on the adequacy of the model you obtained. In case you have investigated robustness of your results by sensitivity, uncertainty, or other analysis, provide the findings.

Some statistical results such as for ANCOVA and multiple comparisons in ANOVA can be difficult to communicate. Software outputs may be voluminous and you may have to devote substantial time in filtering the results of substance. To put them into an intelligible table can be challenging. Thus, there is a tendency to report such results insufficiently. Even reviewers sometimes ignore this deficiency. Take help of a statistical facility in case you face difficulty. Keep the following points in mind.

1. Pay special attention to any sign of flawed data analysis. Appropriate method for the type of data you have should be used that gives results exactly matching with the objectives.
2. Do not confuse statistical significance with medical significance. First, statistical significance can be high (*P*-value really small) due to exceedingly large *n* even when the actual difference is small. Second, nonsignificance can be due to lack of power. For statistically not significant difference, do not say no difference was found. Also, use the technical terms such as 'significance' and 'normal' with care since they can be used in other contexts also.
3. Exercise caution in reporting results with marginal significance such as with $P = 0.06$. Strict level 0.05 or relaxed – either way – should look like that you are fair.

REFERENCE

Chase M (2003). Cancer prevention, at a price. The Wall Street Journal 2003 (June 24).

MedicalBiostatistics.com