

Original Article

Reporting and presentation of statistical analyses: instructions for authors of health sciences journals based in South Africa

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Abstract

Background: Statistical analyses are a key component of quantitative research in health sciences.

Objectives: To review the instructions for authors on reporting and presentation of statistical methods by all health sciences journals based in South Africa.

Methods: Health sciences journals based in South Africa that publish original quantitative research articles were identified using three sources, namely the list of accredited South African journals compiled by the South African Department of Higher Education and Training in 2022, relevant journals covered in Scopus, and web pages of major health sciences publishers in South Africa. The list was cross-checked against the listing of journals in Sabinet, an online database covering South Africa, under the category 'Collection: Medicine and Health'. The instructions for authors given by the journals were accessed through their websites. The form for recording data was based on items listed in the 'Statistical Analyses and Methods in the Published Literature' (SAMPL) guidelines.

Results: All except one of the 52 journals could be located online. Of the 51, 13 (25%) made no mention of statistics in their instructions, and 11 (22%) made only a general statement regarding statistical content with no further guidance. The statistical item most frequently mentioned was the *P* value (45% of journals), whereas the rest of the items appeared in the instructions of 20% or fewer journals. Nine journals (18%) referred to the EQUATOR guidelines, mainly CONSORT (10%).

Conclusion: Nearly half of the health sciences journals based in South Africa either did not mention statistics at all in their instructions for authors or made only a cursory reference to statistics. The study thus emphasizes that these journals, in their instructions for authors, need to cover in greater detail the reporting and presentation of statistical methods in articles reporting quantitative research.

Keywords:

Health sciences journals, reporting statistics, South Africa, statistical guidelines

Introduction

Statistical analyses are a key component of quantitative research in health sciences. The International Committee of Medical Journal Editors (ICMJE) recommends that researchers should ‘[d]escribe statistical methods with enough detail to enable a knowledgeable reader with access to the original data to judge its appropriateness for the study and to verify the reported results.’¹ A ‘knowledgeable’ reader could be a journal editor, a manuscript reviewer, or a reader of a published paper. In addition to the completeness of the description of the methods used for analysis, the presentation of the findings of such analyses should be clear and explanatory.²

Since 1978, the ICMJE has published various versions of its ‘Uniform Requirements for Manuscripts Submitted to Biomedical Journals’.³ At the time of the study, the latest version of the requirements was published in May 2023 and is titled ‘Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals’.¹ These recommendations contain subsections dealing with statistics and presentation of results.⁴

Altman⁵⁻⁷ investigated the reporting of statistics in medical journals over a number of years and, together with colleagues, the statistical aspects of instructions for authors in medical journals.⁸ This work contributed to the establishment of various guidelines hosted by the EQUATOR Network (Enhancing the Quality and Transparency of Health Research) since 2006.⁹ The guidelines ‘aim to improve the clarity of presented methods and results and standardize statistical reporting to enhance comparability with similar research’.¹⁰

The Statistical Analyses and Methods in the Published Literature (SAMPL) guidelines¹¹

deal with general statistical reporting and presentation. These guidelines are

‘a set of statistical reporting guidelines suitable for medical journals to include in their Instructions for Authors. These guidelines tell authors, journal editors, and reviewers how to report basic statistical methods and results. Although these guidelines are limited to the most common statistical analyses, they are nevertheless sufficient to prevent most of the reporting deficiencies routinely found in scientific articles . . .’¹¹ (p. 2.)

The SAMPL guidelines and the ICMJE recommendations stress the importance of reporting results in detail to facilitate their inclusion in further analyses. Other EQUATOR guidelines deal with specific study designs and statistical analyses. Among these, the most well-known guidelines are CONSORT (Consolidated Standards of Reporting Trials, the first such guideline and first published in 1996), STROBE (Strengthening the Reporting of Observational Studies in Epidemiology, first published in 2007) and PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses, first published in 2009).

Journals have a role in ensuring that their instructions on statistical reporting and presentation, as part of the information related to manuscript submission, are clear and complete. As a statistician, author, and reviewer, I have noticed differences in the reporting and presentation of statistical methods in health sciences journals in South Africa but did not find any published research that assesses the relevant instructions provided by these journals. Therefore, the objective of the study was to review the instructions for authors – as published by health sciences journals based in South Africa – on

the reporting and presentation of statistical methods in quantitative research.

Methods

Study design and sampling

This cross-sectional study included all the journals on human health based in South Africa that publish original quantitative research articles. The journals were identified in November 2022 using the list of accredited journals for 2022 compiled by the South African Department of Higher Education and Training (DHET) available on the University of the Free State (UFS) library website. The list of identified journals was supplemented by searching for (i) addresses of journals based in South Africa in the journals covered by Scopus (also available on the UFS library website), (ii) non-accredited health sciences journals based in South Africa of which the researcher was aware, and (iii) the non-accredited journals listed on the websites of the three major health sciences publishers in the country (AOSIS, Medpharm Publications, and SAMA/Health and Medical Publication Group). The final list was verified against the journals listed in Sabinet, an online database covering South Africa, under the category 'Collection: Medicine and Health'.¹²

The Sabinet summary of the journals' contents and the journal websites were checked to determine the focus of each journal. Journals that were focused on continuing medical education, provided only summaries of research published elsewhere, were not focused on health, or were no longer active were excluded.

Data collection

Instructions for authors given by each of the selected journals were accessed through the journal's website during March 2023 and checked again in May 2023. The term 'instructions for authors' covers any content (instructions, guidelines, or information) that

a journal lists as a requirement for submission and includes style guides and templates. One journal stated that instructions for authors were available on request from the journal's editor; however, these were available to me from a colleague who had published a paper (of which I was a co-author) in that journal. I read all the instructions for authors to identify and classify any statements, phrases, or words relating to any aspect regarding the reporting and presentation of statistical analyses.

The form for recording data was based on items listed in the SAMPL guidelines¹¹ and included an option 'Other'. Any reference to the EQUATOR guidelines or the ICMJE Recommendations was noted: a reference to the latter was noted only if it dealt with manuscript content, not authorship criteria or data-sharing statements. The publisher was also noted.

It was also determined whether the journal is part of the Scopus list. Indexing in PubMed was ascertained by typing into PubMed the journal name in full and the official abbreviation and the details of recent manuscripts (from a list of my publications or from the websites of the journals).

Pilot study

A pilot study was carried out using the instructions for authors of one journal from each of the three major publishers of health sciences journals in South Africa and the instructions of one other journal. The data on these four journals were included in the main study. The pilot study showed that no changes to the data form were required for the main study.

Analysis of data

The data were entered into a Microsoft Excel spreadsheet and analysed using SAS ver. 9.4. The results were summarized in the form of frequencies and percentages. Any association between the Scopus and PubMed status of the journal and the extent of inclusion of

statistical elements in the instructions for authors was investigated using the chi-square test and Fisher’s exact test respectively (the latter due to sparse cells).

Ethical aspects

The protocol was approved by the UFS Health Sciences Research Ethics Committee (UFS-HSD2022/2043/2803). The information used was available and accessible online. The journals were identified by numbers, with a separate list linking the numbers to journal titles.

Results

Sabinet featured a total of 101 entries under the heading ‘Medicine and Health’. Of these, 46 fulfilled the inclusion criteria of the study. Six additional journals were identified from the other data sources, giving a total of 52 journals. One journal that appeared on the 2022 DHET list of accredited journals could not be traced online (and was removed from the 2023 DHET list).

Accordingly, results are reported for 51 journals, 30 of which are listed by Scopus and 19 are indexed in PubMed. All the journals are published in English, and 33 are published by any of the three major health sciences publishers in South Africa (AOSIS, Medpharm Publications, and SAMA/Health and Medical Publication Group).

As outlined in Table 1, thirteen (25%) journals made no mention of statistical analyses or presentation; of these, five referred the

authors to the ICMJE or EQUATOR guidelines. Another eleven journals (22%) made only a general statement (such as ‘statistical methods need to be described’) and offered no further detailed guidance, whereas two (4%) included a specific document relating to statistical requirements as part of the instructions.

No statistically significant differences were found between journals listed in Scopus and those not listed in Scopus in terms of the extent to which statistical aspects were mentioned (Table 1, $P = .15$). However, PubMed-indexed journals differed significantly in this aspect from those not indexed in PubMed ($P < .01$): PubMed-indexed journals were more likely to provide some specific guidance and less likely to omit any mention of statistical analyses or presentation than journals not indexed in PubMed.

The item most frequently mentioned in the instructions for authors was the P value: 23 (45%) of the journals mentioned it (Table 2), of which 15 (65%) were from the same publisher, who stipulated in the style guide how the significance of P values must be categorized and flagged in tables. Six other journals (12%) explicitly stated that exact P values must be reported, and two of these cautioned authors against relying only on P values. Two journals offered some guidance on test statistics, of which one required that the test statistics must always be mentioned, whereas the other maintained that they are of no use. Regarding the reporting of decimal points, journals differed in their instructions on the required rounding of percentages and P values.

Table 1. Differences between health sciences journals based in South Africa in terms of the extent of instructions for authors related to statistical analyses and presentation

| Extent of instructions | Total (n = 51) | | Listed in Scopus | | | | Indexed in PubMed | | | |
|--------------------------|----------------|----|------------------|----|-------------|----|-------------------|----|-------------|----|
| | n | % | Yes (n = 30) | | No (n = 21) | | Yes (n = 19) | | No (n = 32) | |
| No mention | 13 | 25 | 5 | 17 | 8 | 38 | 0 | 0 | 13 | 41 |
| A general statement | 11 | 22 | 6 | 20 | 5 | 24 | 3 | 16 | 8 | 25 |
| Some specifics mentioned | 27 | 53 | 19 | 63 | 8 | 38 | 16 | 84 | 11 | 34 |

Table 2. Statistical items (drawn from the SAMPL guidelines) mentioned in instructions for authors by health sciences journals based in South Africa (n=51)

| Item | n | % |
|--|----|----|
| Statistical software used | 3 | 6 |
| Descriptive statistics (e.g. mean or median or percentage) | 10 | 20 |
| Reporting of decimal points | 6 | 12 |
| Distribution of numerical variables | 1 | 2 |
| Data transformation | 0 | 0 |
| Missing data | 1 | 2 |
| Multiple comparisons | 1 | 2 |
| One versus two-tailed tests | 1 | 2 |
| Pre-specified versus exploratory analyses | 3 | 6 |
| Level of statistical significance | 1 | 2 |
| P values | 23 | 45 |
| Confidence intervals | 7 | 14 |
| Test statistics | 2 | 4 |
| Correlation analysis | 1 | 2 |
| Regression analysis | 1 | 2 |
| Association analysis | 6 | 12 |
| Analysis of variance/covariance | 0 | 0 |
| Survival analysis | 1 | 2 |
| Bayesian analysis | 0 | 0 |

Other topics mentioned were the number needed to treat (two journals), the preferred notation for *P* values (two journals: one required that the value be written *without* a zero before the decimal point and the other, *with*, as in .034 versus 0.034), effect sizes and their clinical and statistical significance (one journal), examples of correct notation and abbreviations for statistical terms (one journal), power analysis (one journal), referencing of complex or unusual statistical techniques (one journal), need to avoid non-technical use of statistical terms such as ‘correlation’ and ‘random’ (one journal), and protocol statistical analysis plan (one journal).

Nine journals (18%) referred to the EQUATOR guidelines, either in general or to specific guidelines, mainly CONSORT (10%) (Table 3). Only one journal referred to the SAMPL guidelines. Only three (6%) journals required

Table 3. Guidelines mentioned in the instructions for authors of South African-based health sciences journals (n=51)

| Guideline | n | % |
|---|---|----|
| Any EQUATOR | 9 | 18 |
| CONSORT | 5 | 10 |
| STROBE | 1 | 2 |
| PRISMA | 3 | 6 |
| SAMPL | 1 | 2 |
| EQUATOR in general | 4 | 8 |
| EQUATOR checklist a requirement | 3 | 6 |
| ICMJE’s ‘Uniform requirements’ ¹ | 9 | 18 |

¹All journals referring to ICMJE used the old title of the documentation.

that an EQUATOR checklist be submitted with the manuscript: one required this for randomized controlled trials (CONSORT), one for systematic reviews (PRISMA), and one required the checklist appropriate for the study design. Nine journals (18%) referred to the ICMJE’s ‘Uniform requirements’, and four journals (8%) referred to the EQUATOR guideline and to the ‘Uniform requirements’.

Not all the journals from a given publisher provided the same instructions: some added a number of items (mainly those listed in SAMPL or ICMJE), whereas others excluded items from the core list of items used by other journals from that publisher.

Discussion

Of the total, a quarter of the journals made no mention of any statistical aspect in their instructions for authors. This is worrying, because quantitative research and the accompanying statistical analyses are indispensable to health sciences research. The absence of guidance on good practice by journals could lead to poor reporting and presentation by authors and, in turn, readers considering such poor reporting as appropriate or acceptable. In addition, the lack of instructions in this regard could lead to reviewers requiring authors to adhere to the reviewers’

personal preferences regarding presentation and reporting. Approximately a third of the journals making no mention of statistics in their instructions for authors referred prospective authors to the EQUATOR guidelines or the ICJME requirements. Both are lengthy documents, and one can only guess the extent to which authors would work their way through the two sources. Lang and Altman¹¹ specifically stated that their guidelines should be *included* in the journal's instructions for authors. Malički et al.¹³ suggest that 'as most scientific publishing today is predominantly handled through online submission systems, ItA [Instructions to authors] might also benefit from moving away from a (downloadable) document form to full integration within those systems'. Although guidelines such as EQUATOR and ICMJE have been available for many years, the instructions for authors of many journals, including international journals, frequently do not refer to these guidelines.^{14,15}

In a systematic review of 153 studies published between 1987 and 2017, investigating instructions for authors by journals in any field, only 7 (4.6%) investigated statistics, compared to 51 (33.3%) and 44 (28.8%) investigating reporting guidelines and ICMJE's 'Uniform requirements', respectively.¹⁶ Relevant and recent international findings to compare with the local findings are thus limited. Malički et al.¹³ studied the instructions for authors in a sample of 835 journals listed in Scopus or Science Citation Index Expanded, of which 153 were health sciences journals. Their focus was on transparency in reporting and research integrity, but some of the items investigated in the instructions dealt with statistical aspects. Whereas in the present study 10% of the journals based in South Africa referred to CONSORT, the figure was 29% for health sciences journals included in the study of Malički et al.¹³ Malicki et al.¹³ also found

that health sciences journals were much more likely to refer to the EQUATOR guidelines than journals in other fields (as expected since EQUATOR is aimed at health sciences), and that CONSORT was the guideline most frequently referred to. In the present study, 14% of the health sciences journals based in South Africa referred to confidence intervals, compared to 10% of health sciences journals and fewer than 5% of the journals in other fields in the study of Malički et al.¹³

These findings highlight some areas in which journals differ in their requirements for a specific item. For authors and reviewers, this complicates the publication process. As an author, I have received comments from reviewers (an EQUATOR checklist needs to be added, for example), reflecting requirements not of the specific journal for which the manuscript in question was being reviewed but possibly of other journals for which they served as reviewers. Some uniformity in requirements would be advisable, as suggested by authors taking part in the study of Praveen et al.¹⁷ among dental faculty. Ufnalska and Terry¹⁸ have drafted a 'Proposed universal framework for more user-friendly author instructions', which recommends that the methods section should have a subheading 'Statistical analysis', which identifies the variables and the statistical methods used. The only other mention of statistical aspects in the framework is regarding the notation of *P* values and confidence intervals.

The present study, which examined the instructions for authors of all health sciences journals based in South Africa that publish quantitative research, is the first investigation in this context. Among the limitations of the study is the fact that only one individual (the author) identified the qualifying journals and studied their instructions for authors. The small sample size also limited the investigation of associations. It was planned

to compare the instructions for authors of journals in different areas of health sciences, but the comparison could not be pursued because many health sciences journals based in South Africa have a broad scope and are not confined to a specific area within health sciences. Investigating the statistical aspects of manuscripts published in these journals could have added a different perspective.

In conclusion, nearly half of health sciences journals based in South Africa either made no mention of statistical analyses and presentation in their instructions for authors or did so only cursorily, limited to a general statement; a few journals mentioned EQUATOR guidelines. This lack of specific instructions could lead to poor reporting practices by authors and may allow reviewers to impose their personal preferences on authors. The journals also differed in their instructions on specific topics. Such divergence complicates the publication process for authors and the reviewing process for reviewers.

Journal editors need to consider the existing guidelines and how best to incorporate key items into their instructions for authors so that authors and reviewers adhere to good practices that are not journal specific and so that readers see papers that adhere to the good practices.

Further research can analyse manuscripts published in health sciences journals based in South Africa in terms of how statistical aspects are presented and reported. Such a study would also be valuable in identifying the most frequently used analyses and in determining whether the journals' instructions for authors address those most common analyses.

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