How to write and publish a paper

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Adrian Aldcroft, Editor in Chief, BMJ Open

Writing research papers and using reporting guidelines

- Resources
- IMRaD
- Writing style

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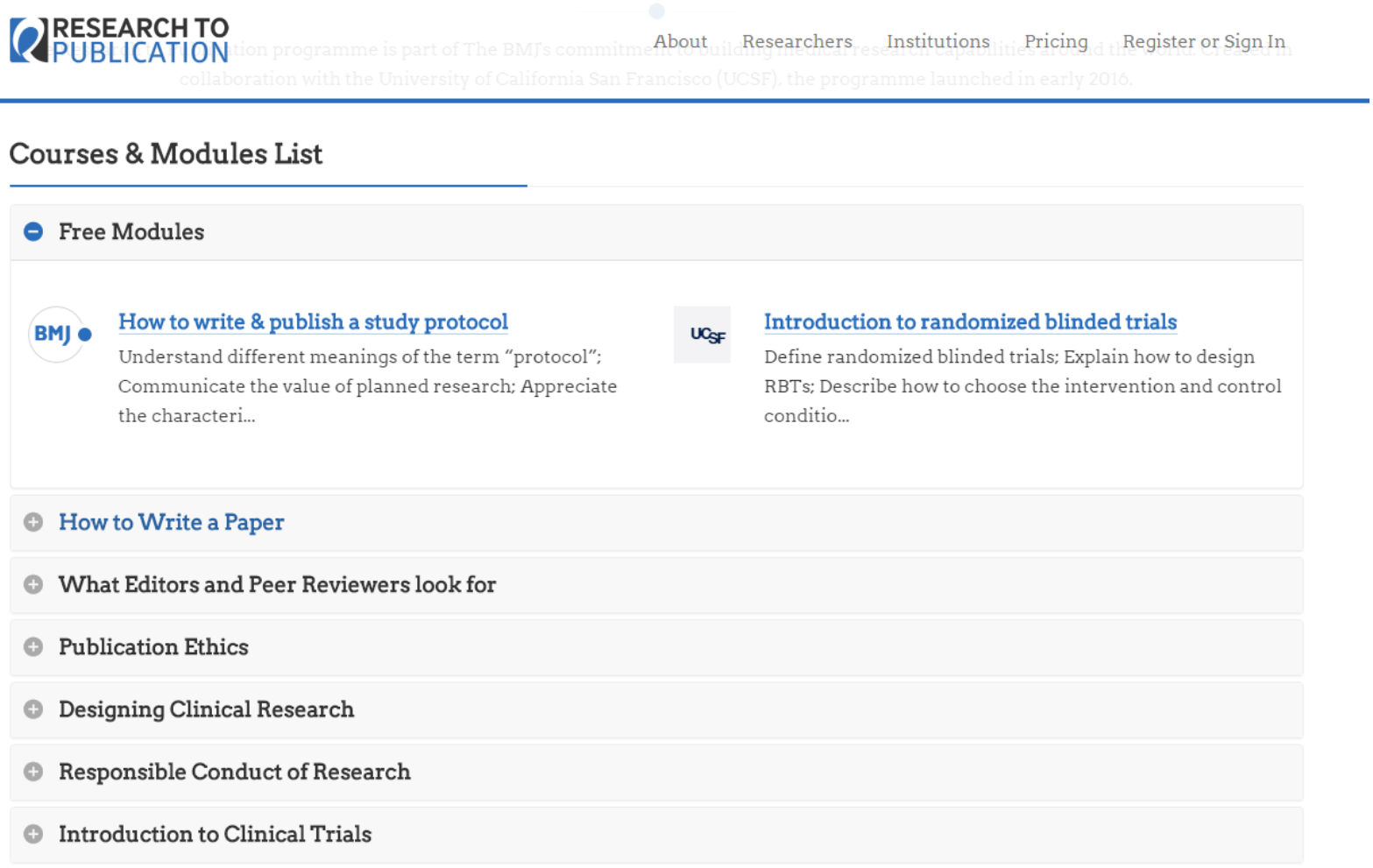
Research to Publication



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Core guidance on writing papers

- **International Committee of Medical Journal Editors** recommendations for manuscripts submitted to biomedical journals **http://www.icmje.org/recommendations/browse/manuscript-preparation/preparing-for-submission.html**

- Reporting guidelines for research, at the **EQUATOR network** **http://www.equator-network.org/**

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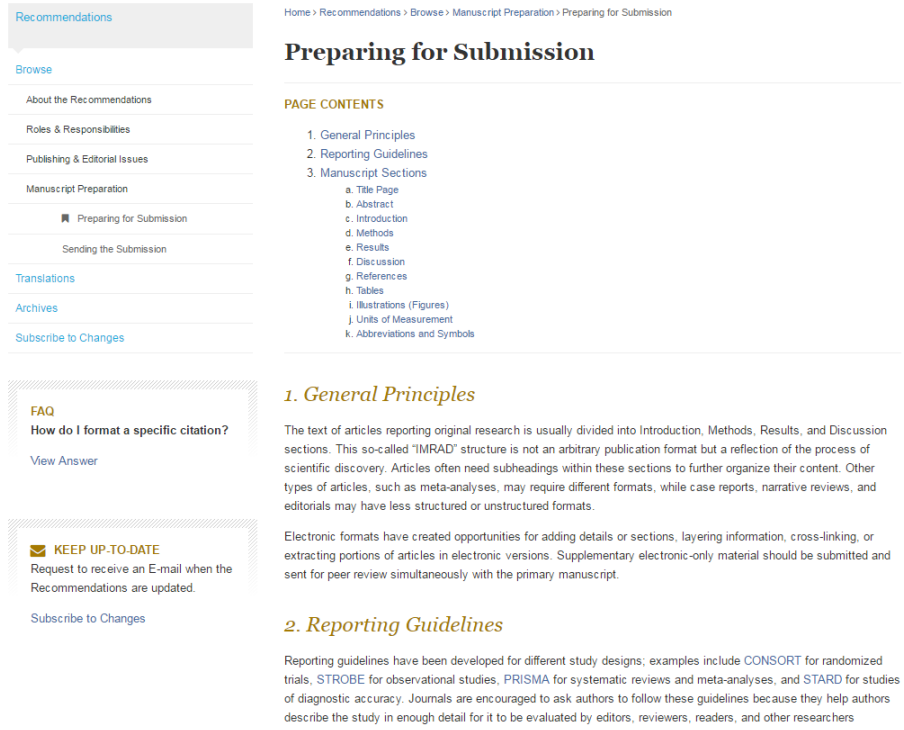
ICMJE guidelines on manuscript preparation

The International Committee of Medical Journal Editors (ICMJE) is a small working group of general medical journal editors that meets annually to work on the Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals.

Members: Annals of Internal Medicine, The BMJ, Canadian Medical Association Journal, Chinese Medical Journal, Ethiopian Journal of Health Sciences, JAMA, Nederlands Tijdschrift voor Geneeskunde (The Dutch Medical Journal), New England Journal of Medicine, New Zealand Medical Journal, Revista Médica de Chile, PLOS, Tidsskrift for Den Norske Lægeforening (The Journal of the Norwegian Medical Association), The Lancet, Ugeskrift for Laeger (Journal of the Danish Medical Association), the U.S. National Library of Medicine, and the World Association of Medical Editors.



Recommendations

Browse
- About the Recommendations
- Roles & Responsibilities
- Publishing & Editorial Issues
- Manuscript Preparation
  - Preparing for Submission
  - Sending the Submission
- Translations
- Archives
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FAQ
How do I format a specific citation?
View Answer

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Preparing for Submission

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3. Manuscript Sections
   a. Title Page
   b. Abstract
   c. Introduction
   d. Methods
   e. Results
   f. Discussion
   g. References
   h. Tables
   i. Illustrations (Figures)
   j. Units of Measurement
   k. Abbreviations and Symbols

1. General Principles

The text of articles reporting original research is usually divided into Introduction, Methods, Results, and Discussion sections. This so-called "IMRAD" structure is not an arbitrary publication format but a reflection of the process of scientific discovery. Articles often need subheadings within these sections to further organize their content. Other types of articles, such as meta-analyses, may require different formats, while case reports, narrative reviews, and editorials may have less structured or unstructured formats.

Electronic formats have created opportunities for adding details or sections, layering information, cross-linking, or extracting portions of articles in electronic versions. Supplementary electronic-only material should be submitted and sent for peer review simultaneously with the primary manuscript.

2. Reporting Guidelines

Reporting guidelines have been developed for different study designs; examples include CONSORT for randomized trials, STROBE for observational studies, PRISMA for systematic reviews and meta-analyses, and STARD for studies of diagnostic accuracy. Journals are encouraged to ask authors to follow these guidelines because they help authors describe the study in enough detail for it to be evaluated by editors, reviewers, readers, and other researchers

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EQUATOR network

- **Enhancing the QUAlity and Transparency Of health Research**

equator network

Enhancing the QUAlity and Transparency Of health Research

EQUATOR resources in Portuguese | Spanish

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Your one-stop-shop for writing and publishing high-impact health research

find reporting guidelines | improve your writing | join our courses | run your own training course | enhance your peer review | implement guidelines

Library for health research reporting

The Library contains a comprehensive searchable database of reporting guidelines and also links to other resources relevant to research reporting.

- Search for reporting guidelines
- Not sure which reporting guideline to use?
- Reporting guidelines under development
- Visit the library for more resources

Reporting guidelines for main study types

Randomised trials	CONSORT	Extensions	Other
Observational studies	STROBE	Extensions	Other
Systematic reviews	PRISMA	Extensions	Other
Case reports	CARE	Extensions	Other
Qualitative research	SRQR	COREQ	Other
Diagnostic / prognostic studies	STARD	TRIPOD	Other
Quality improvement studies	SQUIRE		Other
Economic evaluations	CHEERS		Other
Animal pre-clinical studies	ARRIVE		Other
Study protocols	SPIRIT	PRISMA-P	Other

See all 343 reporting guidelines

EQUATOR Publication School: December 2016, Australasian EQUATOR Centre

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EQUATOR Network and Penelope

- Tool to help choose a report and complete a checklist
  - http://www.goodreports.org/
- Tool integrated with BMJ Open to help authors submit their paper
  - https://app.penelope.ai/manuscript-check/bmj_open

Guideline checklist example: STROBE

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is

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IMRaD structure for research papers

- **Introduction**: why ask this research question?
- **Methods**: what did I do?
- **Results**: what did I find?
- **and**
- **Discussion**: what might it mean?

Austin Bradford Hill, BMJ 1965

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IMRaD structure: Introduction

- Brief background for this audience
- 3-4 paragraphs only: mind the word limit
- What's known/not known on research question
- Don't bore readers, editors, reviewers
- Don't boast about how much you have read

The research question

- State it clearly in last paragraph of introduction
- State why the question matters

IMRaD structure: Methods I

- Should be like a recipe
- Most important section for informed readers
- Follow reporting guidelines, e.g., CONSORT Statement
- Describe measures to ensure ethical conduct
- Fully describe and give references for lab/stats methods
- **Question**: How detailed do you think the methods should be?

IMRaD structure: Methods II

- Describe **PECO/PICO** elements of the study:
  - **P** - which patients, which population, what problem(s)?
  - **I or E** - which intervention(s) or exposure(s)?
  - **C** – which comparison group? Any randomisation or stratification?
  - **O** - what outcome(s) or endpoint(s)? Define primary and secondary outcome(s)

Ethical aspects to consider in the Methods section

Ethics aspects of methods:

- What was the consent procedure?
- Were there any deviations from normal practice?
- Might publication reveal patients' identities?
- What burden was imposed?
- What are the risks and benefits for participants/others?
- How might society or future patients benefit in time?

IMRaD structure: Results

- Report results fully & honestly, as pre-specified
- Text (story), Tables (evidence), Figures (highlights)
- Report primary outcomes first
- Give confidence intervals for main results
- Report essential summary statistics
- Leave out non-essential tables and figures; these can be included as supplementary files
- Don’t start discussion here

IMRaD structure: Discussion

- Don’t simply repeat the introduction. Include the following:
  - Statement of principal findings
  - Strengths & weaknesses of the study
  - Strengths & weaknesses in relation to other studies & key differences
  - Possible mechanisms & explanations for findings
  - Potential implications for clinicians or policymakers
  - Unanswered questions and future research

Abstracts

- Often the only part of the study that will be read
- All authors must approve it
- Editors may screen papers based on the abstracts

- Structured abstracts for The BMJ need:
  - 300-400 words
  - Structured format
  - Active voice
  - Results plus p values
  - %s with denominators
  - No references
  - Trial registration details

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Structured abstracts

Post-traumatic stress, anxiety and depression following miscarriage or ectopic pregnancy: a prospective cohort study

Jessica Farren[1], Maria Jalmbrant[2], Lieveke Ameye[3], Karen Joash[1], Nicola Mitchell-Jones[4], Sophie Tapp[1], Dirk Timmerman[3,5], Tom Bourne[1,3,5]

Abstract

Objectives This is a pilot study to investigate the type and severity of emotional distress in women after early pregnancy loss (EPL), compared with a control group with ongoing pregnancies. The secondary aim was to assess whether miscarriage or ectopic pregnancy impacted differently on the type and severity of psychological morbidity.

Design This was a prospective survey study. Consecutive women were recruited between January 2012 and July 2013. We emailed women a link to a survey 1, 3 and 9 months after a diagnosis of EPL, and 1 month after the diagnosis of a viable ongoing pregnancy.

Setting The Early Pregnancy Assessment Unit (EPAU) of a central London teaching hospital.

Participants We recruited 186 women. 128 had a diagnosis of EPL, and 58 of ongoing pregnancies. 11 withdrew consent, and 11 provided an illegible or invalid email address.

Main outcome measures Post-traumatic stress disorder (PTSD) was measured using the Post-traumatic Diagnostic Scale (PDS), and anxiety and depression using the Hospital Anxiety and Depression Scale (HADS).

Results Response rates were 69/114 at 1 month and 44/68 at 3 months in the EPL group, and 20/50 in controls. Psychological morbidity was higher in the EPL group with 28% meeting the criteria for probable PTSD, 32% for anxiety and 16% for depression at 1 month and 38%, 20% and 5%, respectively, at 3 months. In the control group, no women met criteria for PTSD and 10% met criteria for anxiety and depression. There was little difference in type or severity of distress following ectopic pregnancy or miscarriage.

Conclusions We have shown a large number of women having experienced a miscarriage or ectopic pregnancy fulfil the diagnostic criteria for probable PTSD. Many suffer from moderate-to-severe anxiety, and a lesser number depression. Psychological morbidity, and in particular PTSD symptoms, persists at least 3 months following pregnancy loss.

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Question: With the technology available today, should we still be using the IMRaD structure?

- There are new opportunities (e.g., video abstracts and methods, publishing datasets)
- There have been changes to research article format (data and PPI statements)
- However there is a logic and simplicity that makes the IMRaD structure relevant today

Why publish study protocols?

Why publish study protocols?

- Keep researchers and funding bodies up-to-date
- Enable collaboration amongst the research community
- Prevent unnecessary duplication of work
- Increase transparency by making more information available than required by trial registries
- Give others the opportunity to see and understand deviations that occur during the study
- **Increase transparency and trust**

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Publishing study protocols in BMJ Open

- Protocol manuscripts should report planned or ongoing research studies. We will not consider study protocols for research that is complete or nearing completion.
- If available, use reporting guidelines specific to study protocols (e.g., SPIRIT and PRISMA-P)

Publishing study protocols in *BMJ Open*

- Broadly use the same principles and policies as research articles, with the following differences:
  - Please include the planned dates of the study both in the manuscript and cover letter
  - Include an Ethics and Dissemination section in both the Abstract and manuscript
  - A Discussion section is not required

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Peer review of study protocols in *BMJ Open*

- *BMJ Open* will consider publishing without peer review protocols that have formal ethical approval *and* funding from a recognised, open access advocating research-funding body (such as those listed by the JULIET project)
- Provide proof of peer review by the funder as part of the manuscript submission
- The intention of peer review is not to alter the study design, but to judge whether the study design is sound and to improve reporting/transparency

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Choosing a journal

- Factors in choosing a journal
- Journal metrics (e.g., Impact Factor)
- Predatory journals

What journals provide: peer review & scholarly publishing

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Factors to consider when choosing a journal

- Journal scope
- Journal indexing and Impact Factor
- Language of publication
- Likelihood of acceptance
- Speed of publication
- Colleagues’ advice
- Open access or not?
- Publication fees
- Editorial and peer review policies

The purpose of journals often differs

- For readers
  - Many journals focus largely on readers, choosing and commissioning articles of most interest and use to particular types or group of readers (eg The BMJ, BMJ Supportive and Palliative Care). These may appear online as well as in print, and may provide Open Access.
- For authors and funders
  - Some newer “megajournals” focus on providing authors with a fast, fair peer review process; relatively high acceptance rates, rapid online only publication; and Open Access, e.g., BMJ Open, PeerJ, F1000 Research.

Impact Factor: Questions

- Do you use the Impact Factor when selecting a journal (either as an author or a reader)?
- Do you think journals with a high Impact Factor are “better”?
- Do you know what the Impact Factor represents?

Impact Factor

The 2017 IF for a journal is calculated using the following ratio:

$$\frac{\textbf{Total citations to scholarly articles (published in 2015 and 2016) in 2017}}{\textbf{Number of citable articles in the journal in 2015 and 2016}}$$

Impact Factors

- An Impact Factor of 1.0 means that, *on average*, the articles published 1-2 years ago have been cited one time.
- An Impact Factor of 2.5 means that, *on average*, the articles published 1-2 years ago have been cited 2.5 times.
- The citing works may be articles published in the same journal. ..however, most are from different journals, proceedings, or books indexed by Web of Science.

http://admin-apps.webofknowledge.com/JCR/help/h_impfact.htm

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Impact Factor: Positives

- Intuitively, it seems like a sensible metric to use to place a value on a journal
- Choosing a journal can be difficult—a quantifiable measure is extremely useful. Impact Factor has become the standard in the publishing industry.

Impact Factor: Problems

- Different journals have different objectives
- Authors and publishers play the Impact Factor “game”
- Chasing Impact Factor contributes to bias in the scientific record
- **The Impact Factor can be seen as a driver for research misconduct**

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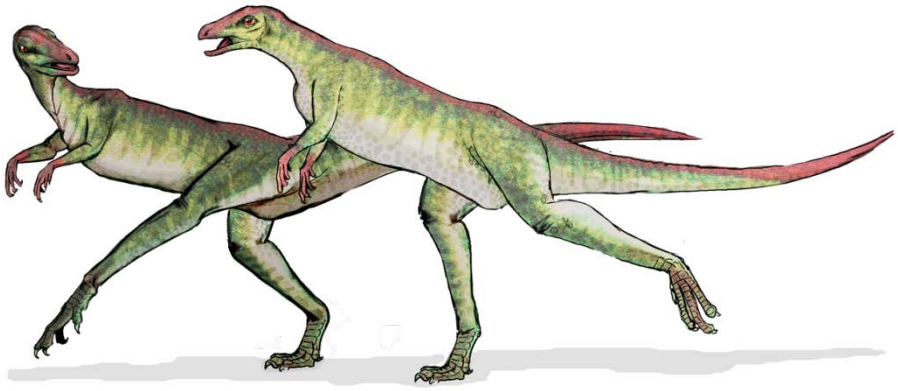
Limitations of Journal Impact Factor

- Skewed by a minority of highly cited articles, e.g., review articles
- Cannot be compared across fields
- Higher in research fields with literature that is cited quickly
- May be artificially inflated by “self citation” by journals
- Calculated using the SCI database that includes only some journals, with a bias towards journals in English



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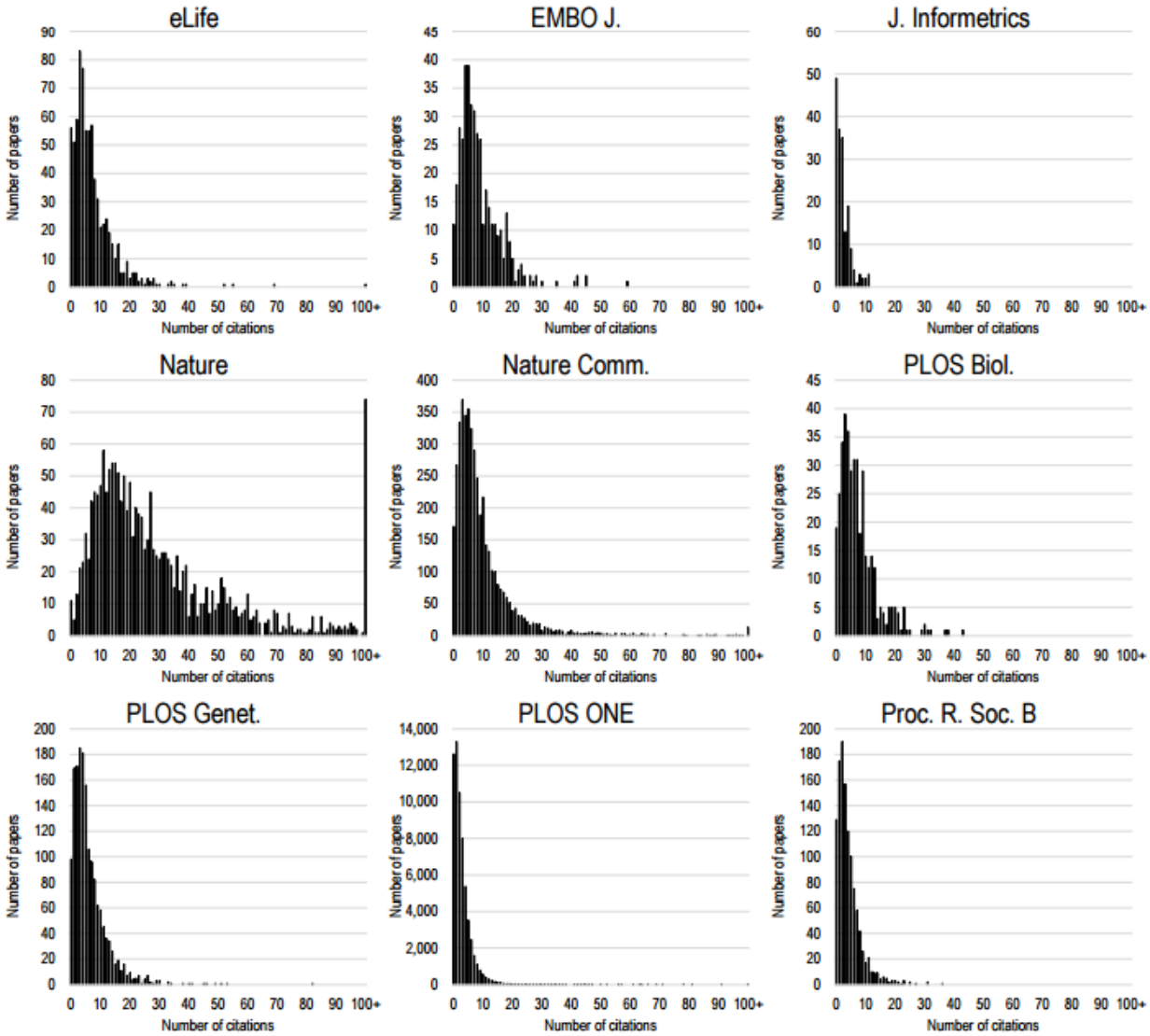
Alternatives: Citation distribution



A simple proposal for the publication of journal citation distributions

Vincent Larivière[1], Véronique Kiermer[2], Catriona J. MacCallum[3], Marcia McNutt[4†], Mark Patterson[5], Bernd Pulverer[6], Sowmya Swaminathan[7], Stuart Taylor[8], Stephen Curry[9*]

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Article Level Metrics

- **Article-Level Metrics** (ALMs) are a new approach to quantifying the reach and impact of published research.
- As electronic dissemination of scholarly content has surpassed print, it has become easier to disaggregate an individual article's impact from the publication in which it appeared.
- It's also possible to track different markers of an article's reach, beyond just citations.
- ALMs seek to incorporate new data sources (sometimes referred to as "altmetrics") along with traditional measures to present a richer picture of how an individual article is being discussed, shared, and used.

http://sparcopen.org/our-work/article-level-metrics/

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Altmetrics

The Altmetric Attention Score and donut are designed to help you easily identify how much and what type of attention a research output has received. You might come across them on publisher article metrics pages, institutional repositories, or even individual researcher or lab publications pages.

You can always click on the donut to visit the details page for the research output, to see the original mentions and references that have contributed to the attention score.

The colors of the Altmetric donut each represent a different source of attention:

- Policy documents
- News
- Blogs
- Twitter
- Post-publication peer-reviews
- Facebook
- Sina Weibo
- Wikipedia
- Google+
- LinkedIn
- Reddit
- Faculty1000
- Q&A (stack overflow)
- Youtube
- Pinterest

The amount of each color in the donut will change depending on which sources a research output has received attention from:

www.altmetric.com/about-our-data/the-donut-and-score/

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Predatory journals

- These are publications taking fees without providing robust editorial or publishing services.
- They recruit articles through aggressive marketing and spam emails, promising quick review and open access publication for a price. There is little if any quality control and virtually no transparency about processes and fees.
- Their motive is financial gain, and they are corrupting the communication of science.

Firm action needed on predatory journals

BMJ 2015 ; 350 doi: http://dx.doi.org/10.1136/bmj.h210 (Published 17 January 2015)
Cite this as: *BMJ* 2015;350:h210

Article | Related content | Metrics | Responses

Jocalyn Clark, executive editor and assistant professor of medicine [1 2], *Richard Smith, chair* [1 3]

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Get an ORCID number

DISTINGUISH YOURSELF IN THREE EASY STEPS

ORCID provides a persistent digital identifier that distinguishes you from every other researcher and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between you and your professional activities ensuring that your work is recognized. Find out more

1 **REGISTER** Get your unique ORCID identifier Register now! Registration takes 30 seconds.

2 **ADD YOUR INFO** Enhance your ORCID record with your professional information and link to your other identifiers (such as Scopus or ResearcherID or LinkedIn).

3 **USE YOUR ORCID ID** Include your ORCID identifier on your Webpage, when you submit publications, apply for grants, and in any research workflow to ensure you get credit for your work.

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Common issues with Chinese submissions

- Not using a reporting guideline or tailoring the manuscript to the Instructions for Authors
  - Solution: Use the EQUATOR guidelines and Penelope tool
- Unclear timeframe/study design
  - Solution: More detailed methods sections (including timeframes). Publishing/providing study protocols
- Not including limitations
  - Solution: Be honest
- Publication ethics (e.g., plagiarism, authorship changes)
  - Solution: Be up front and honest—editors can be harsh when this issues are uncovered at a late stage

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Thank you