



# Preprints and the changing landscape of biomedical publishing

Jonny Coates Associate Director, ASAPbio

@JACoates, @ASAPbio\_mas.to/@ASAPbio

jonny.coates@asapbio.org

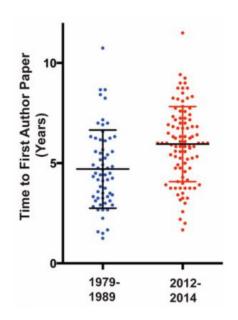


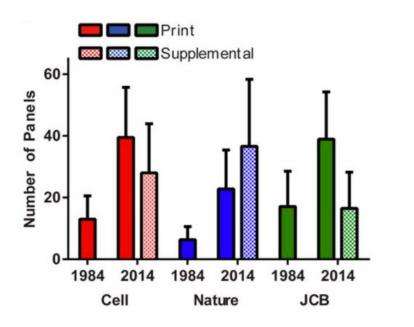
These slides: https://bit.ly/open-sc hol-proj-JAC





# Despite technological advances, journal publication is taking longer than ever





Accelerating scientific publication in biology, Ronald D. Vale Proceedings of the National Academy of Sciences Nov 2015, 112 (44) 13439-13446; DOI: 10.1073/pnas.1511912112 See also
<u>Life Science's Average Publishable Unit (APU) Has</u>
<u>Increased over the Past Two Decades</u>
Cordero RJB et a 2016

# Untangling "publishing"

Dissemination Peer review Curation & prestige

Journals

Motivates delaying sharing for the creation of a complete "story" that will enable a scientist to be competitive for jobs & funding

# Publish, then review

Dissemination

Peer review

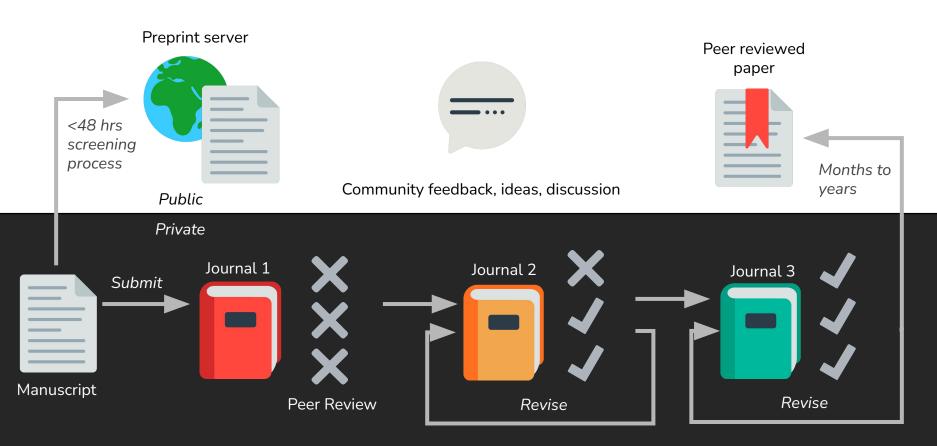
Curation & prestige

Preprints, data, code, open notebooks, etc

Journals, peer review services, curation projects

Stern BM, O'Shea EK (2019) A proposal for the future of scientific publishing in the life sciences. PLOS Biology 17(2): e3000116. https://doi.org/10.1371/journal.pbio.3000116

### Preprints enable rapid dissemination

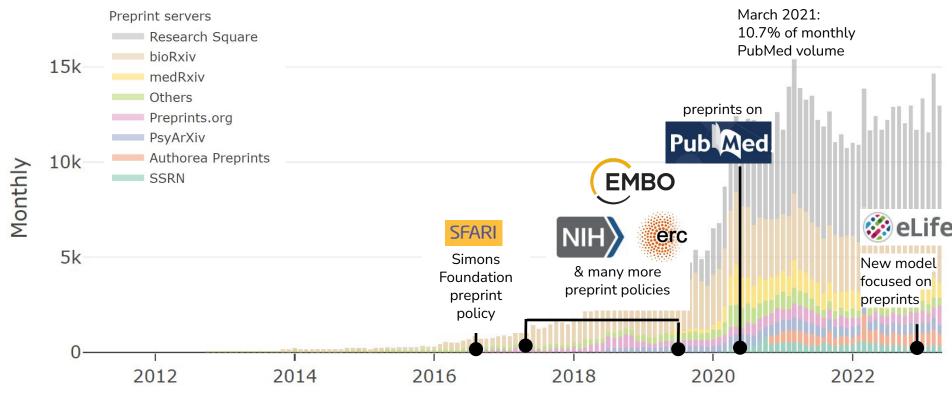


# Preprints are...

- Not peer reviewed by the server before posting
  - Posted rapidly
- Versioned
  - Easily updated or corrected
- Compatible with journals
  - Check SHERPA/ROMEO & journal website
- Citable
  - Receive a DOI
  - Some search tools pool citations to preprints & its journal article (eg Google Scholar)
  - Many funders consider preprints evidence of productivity in grant apps & reports

# Nearly 600,000 life sciences preprints

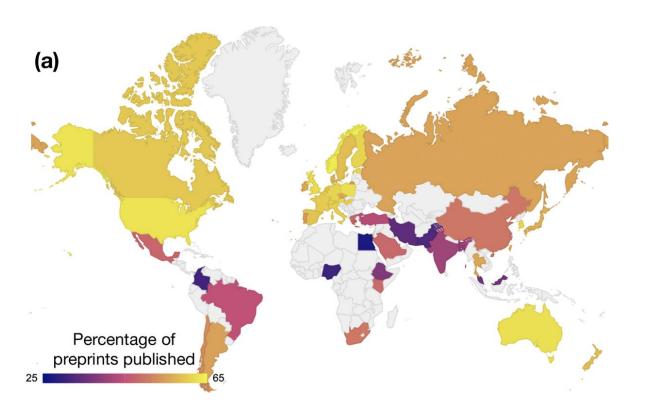
+ millions more in other disciplines & other repositories



https://europepmc.org/preprints

# Preprints reduce barriers to sharing

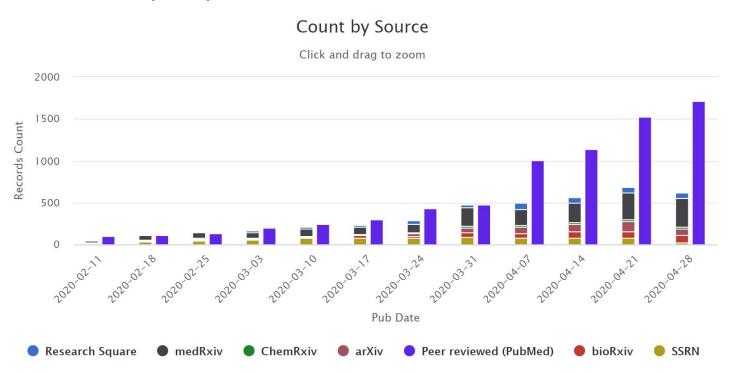
# Preprints are more accessible than journal publication



65% of preprints published in high income countries vs 25% in low-income countries

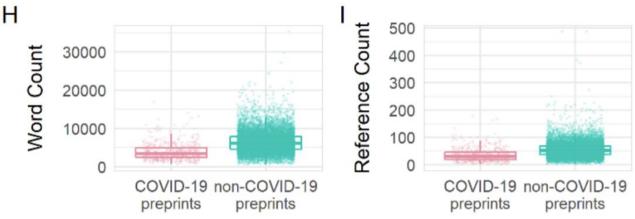
Eckmann P, Bandrowski A (2023) PreprintMatch: A tool for preprint to publication detection shows global inequities in scientific publication. PLoS ONE 18(3): e0281659. https://doi.org/10.1371/journal.pone.0281659

# A significant fraction of COVID-19 research was released as preprints



COVID-19 preprints are short and frequently updated

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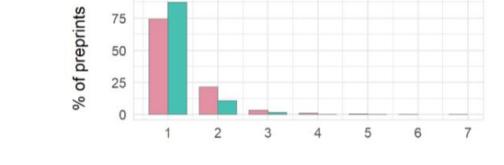


Preprinting the COVID-19 pandemic

Nicholas Fraser, Liam Brierley, Gautam Dey, Jessica K Polka, Máté Pálfy, Federico Nanni, Jonathon Alexis Coates

bioRxiv 2020.05.22.111294; doi:

https://doi.org/10.1101/2020.05.22.111294



(Reviewed by RR:C19)

Number of versions

# Preprints are shaping policy

Home > Coronavirus (COVID-19) action plan



Policy paper

# Coronavirus action plan: a guide to what you can expect across the UK

Published 3 March 2020

#### Contents

- 1. Introduction
- What we know about the virus and the diseases it causes
- How the UK prepares for infectious disease outbreaks
- Our response to the current coronavirus outbreak

#### 1. Introduction

The current novel coronavirus (COVID-19) outbreak, which began in December 2019, presents a significant challenge for the entire world.

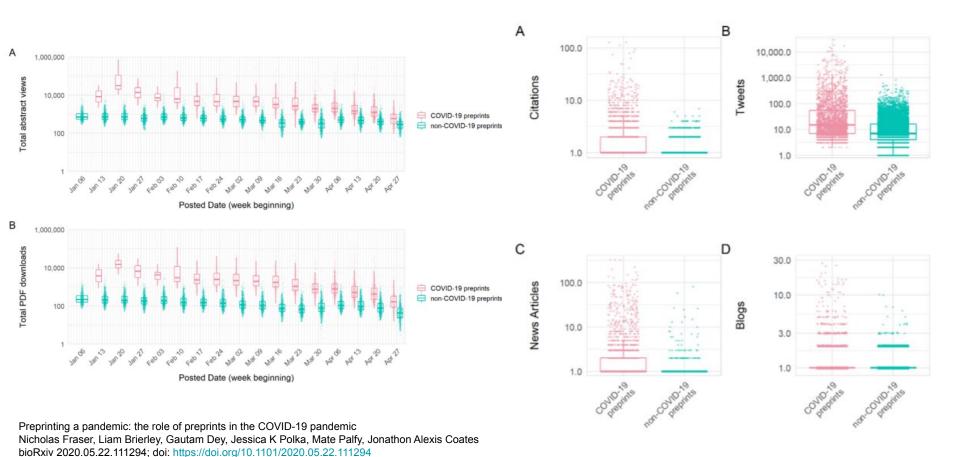
The UK government and the devolved administrations, including the health and social care systems, have planned extensively over the years for an event like this, and the UK is therefore well prepared to respond in a way that offers substantial protection to the public.

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8. Li J, Li S, Cai Y, Liu Q, Li X, Zeng Z, Chu Y, Zhu F, Zeng F. Epidemiological and Clinical Characteristics of 17 Hospitalized Patients with 2019 Novel Coronavirus Infections Outside Wuhan, China. medRxiv. 2020 Jan 1 —

https://www.gov.uk/government/publications/ coronavirus-action-plan/coronavirus-action-pl an-a-guide-to-what-you-can-expect-across-th e-uk

## Unprecedented attention on COVID-19 preprints



### Not peer reviewed ≠ low quality

Nelson L, Ye H, Schwenn A, Lee S, Arabi S, Hutchins BI. Robustness of evidence reported in preprints during peer review. Lancet Glob Health. 2022 Nov;10(11):e1684-e1687. doi: 10.1016/S2214-109X(22)00368-0

100 papers Uncertainty was reduced during peer review, with CIs reducing by 7% on average.

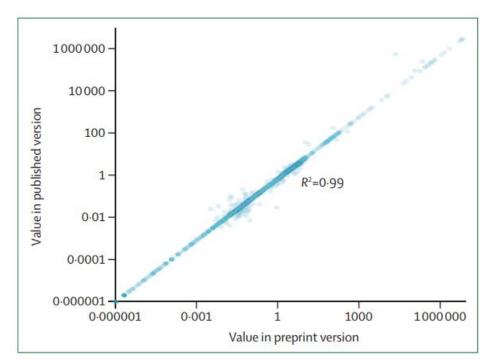


Figure 1: Robustness of preprint data during review
Log scale comparison of epidemiological estimate values reported in preprints vs
their matched values reported in peer-reviewed publications (R²>0.99).

### Not peer reviewed ≠ low quality

Nelson L, Ye H, Schwenn A, Lee S, Arabi S, Hutchins BI. Robustness of evidence reported in preprints during peer review. Lancet Glob Health. 2022 Nov;10(11):e1684-e1687. doi: 10.1016/S2214-109X(22)00368-0

67 articles in the Rapid Reviews: COVID-19 database



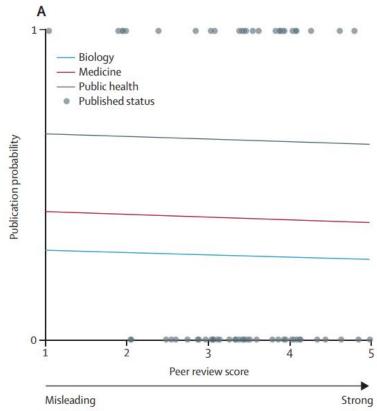
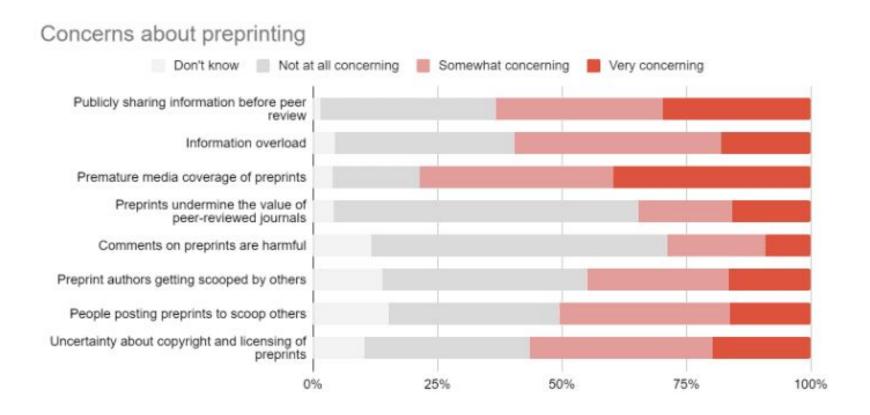


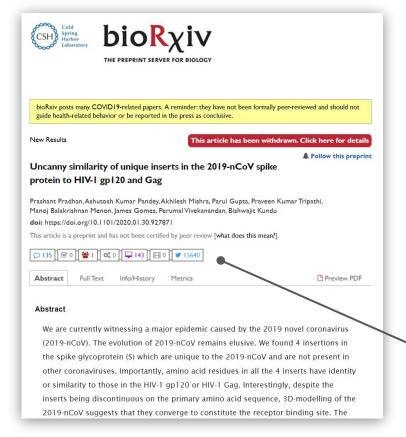
Figure 2: Correlates of peer review

(A) Rug plot and line plot of fitted logistic regression controlling for area of research. 10% jitter was added to the x-axis rug plot data points to facilitate visualisation of otherwise overlapping points. (B) Sorted ratios of the peer-

### Benefits and concerns about preprints

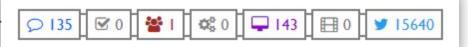


# Public feedback is an important remedy for misinformation



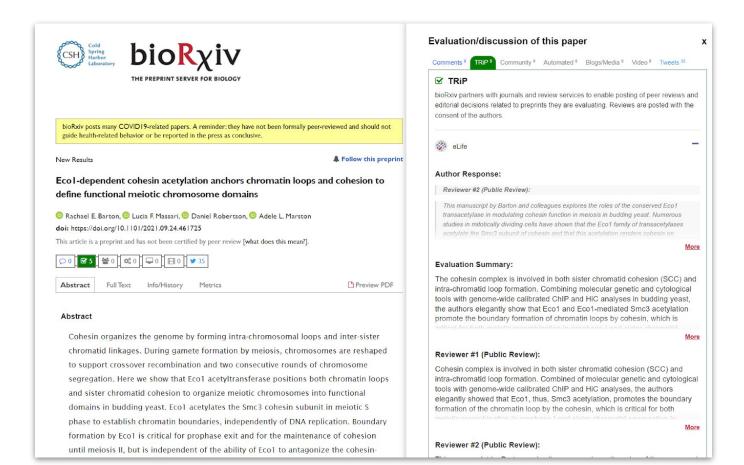
"[T]he reaction from the scientific community to the bioRxiv paper was swift. In a nutshell, **commenters on bioRxiv and Twitter** said, the author's methods seemed rushed, and the findings were at most a coincidence. By Saturday morning, bioRxiv had placed a <u>special warning</u> on all papers about coronavirus. Later Saturday, the authors commented on their paper, saying they were withdrawing it. **And on Sunday, a <u>more formal retraction appeared."</u>** 

https://www.statnews.com/2020/02/03/retraction-faulty-coronavirus-paper-good-moment-for-science/

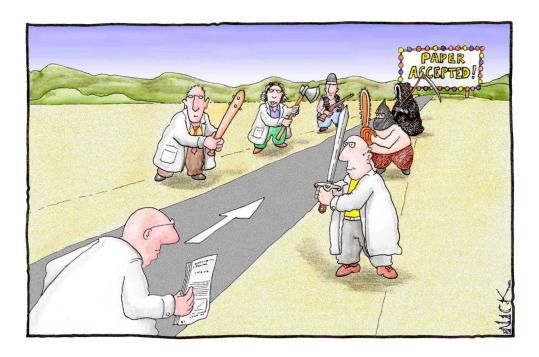


# Preprints promote conversations

## BioRxiv integrates with feedback providers



# Peer reviewers can act as gatekeepers...

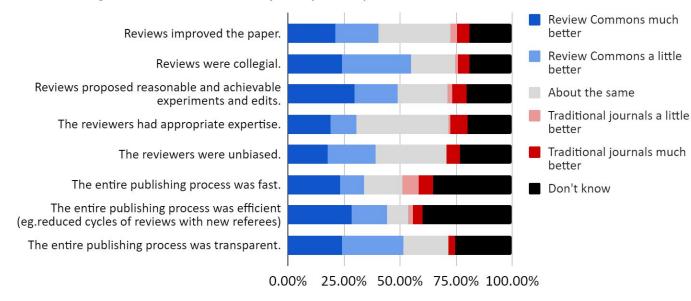


Most scientists regarded the new streamlined peer-review process as 'quite an improvement.'

### ...Or collaborators



Review Commons provides high-quality peer review of preprints before journal submission. Compare your Review Commons experience to your experience as an author at traditional journals over the last year. (n = 95)



### Public feedback advances science & collaboration

Bayesian alternatives for common null-hypothesis significance tests in psychiatry: A non-technical guide using JASP

Daniel S. Quintana<sup>1\*</sup> and Donald R. Williams<sup>2</sup>

https://osf.io/sgpe9/



https://www.facebook.com/groups/853552931365745/permalink/1349684805085886/



Just posted a preprint on Bayesian alternatives for common null-hypothesis significance tests that may be of interest to the group. Our goal was to put together a non-technical walkthrough using JASP for those unfamiliar with Bayesian alternatives. Would appreciate any feedback

#### osf.io

Like Share

Uli Schimmack I thought this would be a tutorial about picking alternative hypothesis to carry out a Bayesian statistical analysis because this is an important additional and new step that researchers are not familiar with. Unlike NHST where you only need to specify H0, default effect size = 0. Bayesian hypothesis testing requires also to specify H1 because BF provide information about the relative support for

Alah, this is just another "tutorial" with all the wrong claims about p-values, a focus on hypothesis testing, when we really want to know how effective drugs are (effect sizes) and a total neglect of Bayesian and frequentist ways to assess the probabilty that a drug is not effective. Daniel Lakens

http://daniellakens.blogspot.ca/.../tost-equivalence...

H0 and H1 given the data.

Excuse me, if this is a bit harsh, but we have been discussing these issues for over a year now and I think it is fair to request a balanced and informative review of options to draw inferences from data

Stop bashing p-values and provide some guidelines for researchers how they can pick a sensible alternative and how they BF have to be interpreted in the light of prior odds of H0 and H1.



#### TOST equivalence testing R package (TOSTER) and spreadsheet

I'm happy to announce my first R package HARTERKENS BLOGSPOT.COM

Like . 0 1 - April 10 at 6:42pm

Daniel Quintana Thanks for the feedback, glad to hear this while it's still a preprint. We actually cited Daniel Lakens' excellent TOSTER paper but I guess we can make this clearer. Like . 0 1 - April 10 at 11:46pm

Daniel Lakens Hi Daniel Quintana, I read the first few pages, and I have good news and bad news. The good news is if the reviewers are all Bayesians, it will be accepted. The bad news is there are quite important misunderstandings of p-values and Bayes factors in the paper.

The hypothesis you describe in the intro (is the null true, or is there an effect larger than 0) can only be tested with p-values. It is underspecified for Bayesian stats. In Bayes, the alternative is 'is there a true effect between x and v with the distribution like z'. So the intro is an argument against Bayes factors. They don't allow you to test the hypothesis you

Then I stopped reading where you said Bayes factors could quantify the size of an effect. It is not true. You need to provide an effect size estimate with a Bayes factor. You can't only report a Bayes factor - it tells you nothing about the size of an effect. This is such a basic misunderstanding, I stopped reading, but you might want to reconsider getting an expert on board?

Finally, you misunderstand p-values. You are re-hashing arguments by p-value bashers. But not by experts on p-values (e.g., Benjamini, Nickerson, Frick). P-values are ONLY used for error control. Not mentioning that in the intro is the last reason this paper should not be read by novices.

Now it will be read, like crazy, because everyone thinks they need to report Bayes Factors. As I have blogged, equivalence tests outperform Bayes factors for testing the absence of any effect you care about. But to quote your excellent podcast: there are acadamic hipsters. They want to twist their mustaches, drink machiato's, and report Bayes factors.

There are thousands of 'intro to Bayes' factors resources. And there are 2 Intermediate Bayes factorsresources. Everybody wants to know what it is. but no one really goes on to use it. Think about that.

Daniel Lakens Here is the critical misunderstanding error (you'll need to remove the criticisms on cohen's d from the paper, or admit you need effect sizes in addition to bayes factors) - also. the Bayes factor can not provide evidence for the presence of an effect See More Like - April 11 at 1:54am - Edited

Daniel Quintana This is very good feedback, great to have extra pairs of eyes looking over this before submission. Looking forward to discussing this topic on our podcast!

Like - 1 - April 11 at 2:05am

Kyle Morrissey There are thousands of intro to Bayes factors resources? That was not my experience :S

Though I finally did have someone run me through the conceptual basics in person the other day, and it made sense Like - April 11 at 8:28am

Daniel Lakens Kyle, -1 for not saying that the intro in my MOOC was all you needed. You can lead a horse to the water, but you can't make them drink.

Like - April 11 at 8:58am Stephen Martin P-values really aren't used for error control That's conflating NP and Fisherian approaches, no?

Piggy backing off this comment thread.... See More Like · April 12 at 12:33am · Edited

Stephen Martin After reading Donald Williams' response, I thought I should just clarify: I'm all for papers giving 'new' (or at least, newly applied) perspectives on old topics, along with critiques of old perspectives on old topics. I intended my reply to be a critique moreso of BFs and some of the specific arguments, not as a critique of you or your intentions. I realized I never actually made that explicit in my reply above. Like . 2 · April 12 at 12:36am

Matt Williams >The hypothesis you describe in the intro (is the null true, or is there an effect larger than 0) can only be tested with p-values. It is underspecified for Bayesian stats. In Bayes, the alternative is 'is there a true effect between x and y with the distribution like z'. [Daniel]

>More importantly though, the p(Model | D) can only be interpreted in the family of models that you're testing, but I think people interpret it as "probability I'm correct". [Stephen]

I agree given the standard interpretation of Bayes factors (where the prior on effect size is treated as part of the H1 model itself). But if you separate out the H1 "hypothesis" from the statistical model/prior the problem becomes sort-of resolvable. This is what I was banging on about in my recent blog: ://thepathologicalscience.blogspot.com/.../separating...

PS. Like Stephen Martin I'm also a Bayesian who doesn't really like Bayes factors, but I'm working on a manuscript at the moment where I've been asked to write an introduction to them for a special issue on methods in a particular sub-area of psych. It's been bloody difficult trying to produce a 'balanced' view of Bayes factors (i.e., balancing reasonable views of frequentists, pro-BF people, and Bayesians who prefer estimation). Thanks Daniel Quintana for provoking a discussion that has been helpful to me in making final revisions.

#### Separating model from hypothesis in the Bayes

Premise When using statistical analyses, we will often test a statistical model that has one or more parts that we regard as

THEPATHOLOGICALSCIENCE BLOGSPOT.COM

Like - April 12 at 4:09pm

Daniel Quintana That blog post is really handy, thanks for sharing! We're working on an update now based on everyone's great feedback

Like - April 13 at 4:48am

it is important to remember the likely readership of this article. I imagine this paper is targeted to those in more clinical fields who have not been exposed to much Bayesian stuff. That said, I am not sure I see this as an introduction to Bayes factors, and especially not Bayesian statistics. Instead. I think this is more of an introduction into the doctrine of Rouder, Wagenmakers..etc (i.e., the BF crew) in psychology. Now that there approach has become more common, this has also resulted in finding several limitations in their approach and downright rebukes of their use of statistics (e.g., our paper; Uli Schimmack and Rickard Carlsson). That said, I think the BF grew does a lot great research, but has also oversold BF and feel as though they have sought extreme examples to show how BF and p differ, but always in favor of their method being superior. That said, rather than introduce this approach circa a few years ago, I see this as a unique opportunity to introduce what might be a "new" method to a field, but also include the recent critiques and other ways of using Bayesian statistics. In this way, we have a fair and balanced paper, and not one slanted towards the BF crew's philosophy that has dominanted psychology. Not that Dominant means the approach is necessarily good (or bad), just that they were shouting the loudest and often publishing things that were not novel other than computing a Bayes factor. This resulted in a flurry of opportunistic Bayes factor publications. Those days are hopefully winding down, although now the challenge is that more people are using JASP without really understanding what is going on. I cannot blame them, as the ease with which BF can be manipulated is not really described in any amount of detail-e.g., the infamous prior odds on Bem's ESP. As for the paper, I would steer away from critiquing p-values and instead think of ways we can think about using them. For example, p can be considered as a kind of model fit indices, not for the observed data, but to the null sampling distribution. That is, if we set up a null model (or envision a hypothetical null model), p gives us a measure of departure from that model. The question then becomes contexts in which this is useful, or what needs to accompany p to ensure it is valid and allows for rich inferences-there are lots and lots of assumptions that may or may not make sense depending on the situation, but no less sensible than any statistical quantities assumptions. While much attention has been paid to the Bayesian prior, what is less considered is the chosen likelihood, which is a modeling based decision both frequentist's and Bavesian's make, but Bayesian more explicitly so. That said, Bayesian's do not often examine the influence of distributional departures from the chosen likelihood on the resulting posterior (to my knowledge). These are important issues, as they directly affect the density with which Bayes factors are computed. How does non-normality, unequal variances, treating a count variable as continuous influence the resulting Bayes factor, for example? This says nothing about the importance of fully understanding that BF is a model comparison metric. It provides relative evidence. This generally comes with even odds on the null and alternative. This does not makes much sense, but I have also made this assumption in some of my work. I am not sure this is more unreasonable than testing the value of zero in a frequentist framework, so proceeded but with effect size estimates and intervals on those effects (quantities not provided by Bayes factors). These are important issues, and I see that you have a unique opportunity to introduce the current state of Bayesian methods to your field (prior odds, the importance of the prior, and inferences obtained from the posterior...etc.). This also comes with great responsibility, and I think it would be a shame to align yourself so heavily with the BF crew Like 0 5 - April 12 at 12:57am - Edited

Donald Williams Hi Daniel Quintana. To all providing comments, I think

in their use of not only Bayesian statistics, but also their arguments against p-values.

Donald Williams Let me also say that I too made many of the similar arguments against p-values in the past. Since then, I learned that p is not evil, and that Bayes factors are not great. They simply are what they are, and the problem really arises from misuse or misunderstandings. Like · 0 4 · April 12 at 12:36am

Daniel Quintana Thanks for these comments. In earlier versions of the manuscript we went into a lot more depth (including the importance of the chosen likelihood) but were squeezed for space. The tricky thing here is to make this paper approachable to those who are more clinically oriented, while also appropriately covering all the important issues (and keeping within word limits).

Like · 0 1 · April 12 at 2:26am

Donald Williams One thing I forgot to mention is whether in clinical oriented work we even care about model selection via bayesian null hypothesis testing? For example, for making treatment decisions, what is more informative: d = 0.30, 95-% CI



Dan Quintana @dsquint... 15h Replying to @dsguintana @jessi...

....I reached out to one of the people who wrote some of the critical feedback and asked if he wanted to join as a coauthor.













Dan Quintana @dsquint... 15h Replying to @dsquintana @jessi...

He agreed M So with his input and re-writes, along with input from others, the paper was updated to its current version.













Dan Quintana @dsquint... 15h

Replying to @dsquintana @jessi...

Now the paper is under review at a top journal. I also mentioned in the cover letter that the preprint had been downloaded 700+ times



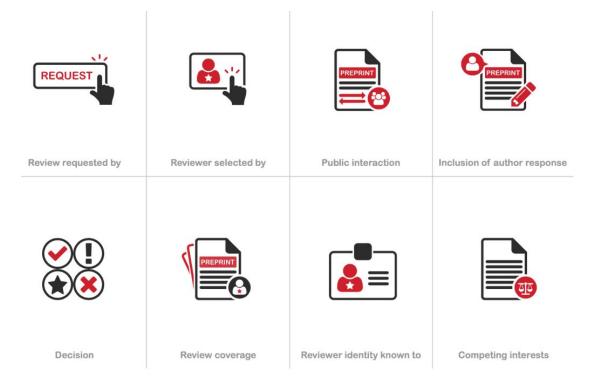








# Preprint review opens up a higher-dimensional space for experimenting with peer review



https://osf.io/8zj9w/

PReF (Preprint Review Features)

## The preprint feedback ecosystem

Linking and discovery









Protocols & frameworks









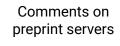


Preprint feedback initiatives

**Preprints** 



































Minimalist or freeform







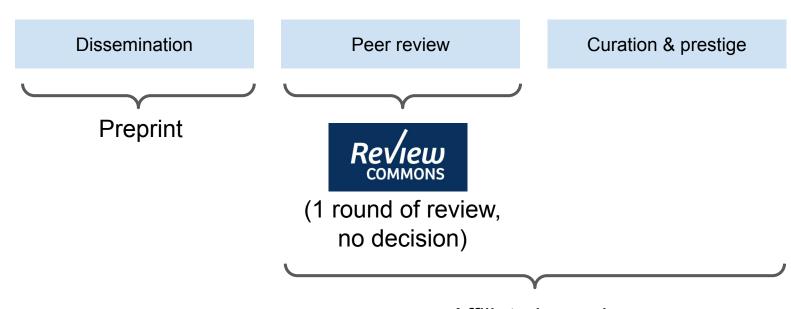








# Recognizing preprint review

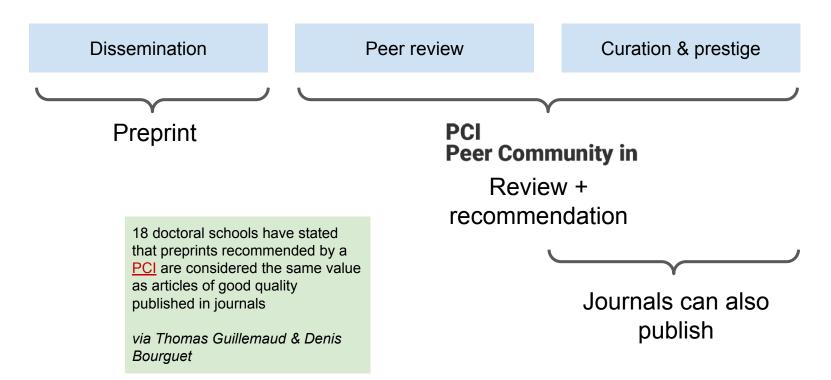






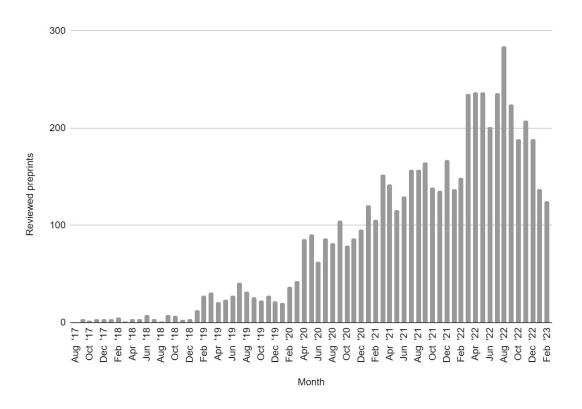
Affiliate journals agree not to restart peer review

# Recognizing preprint review



https://peercommunityin.org/

# Growth of preprint review over time



Preprints reviewed per month on Sciety, excluding reviews conducted by automated tools (ScreenIT) and reviews by journals posted after publication of the journal version. (Source: <a href="10.31219/osf.io/cht8p">10.31219/osf.io/cht8p</a>)

## Formal recognition for preprint peer review

18 doctoral schools have stated that preprints recommended by a PCI are considered the same value as articles of good quality published in journals

via Thomas Guillemaud & Denis Bourguet

#### **FEATURES**

Refereed preprints recognized as eligibility criterion for EMBO Postdoctoral Fellowships

EMBO will accept first author refereed preprints in applications for postdoctoral fellowships in a four-month trial

Read more



Papers subjects to a 'journal-independent standard peer review process [...] are considered by most cOAlition S organisations to be of equivalent merit and status as peer-reviewed publications that are published in a recognised journal or on a platform."

Statement on July 6, 2022

Preprints and open science



Council of the EU Press release 23 May 2023 10:27

# Council calls for transparent, equitable, and open access to scholarly publications

"In its conclusions, the Council calls on the Commission and the member states to support policies towards a **scholarly publishing model that is not-for-profit, open access and multi-format, with no costs for authors or readers.**"

A publish-review-curate system, directly supported by institutions & funders, can achieve this



# OFFICE OF SCIENCE AND TECHNOLOGY POLICY WASHINGTON, D.C. 20502

SUBJECT: Ensuring Free, Immediate, and Equitable Access to Federally Funded Research

"all peer-reviewed scholarly publications authored or co-authored by individuals or institutions resulting from federally funded research are made freely available and publicly accessible by default in agency-designated repositories without any embargo or delay after publication"

A publish-review-curate system, directly supported by institutions & funders, can achieve this

# Thank you

#### **ASAPbio staff**

Jessica Polka Anna Drangowska-Way

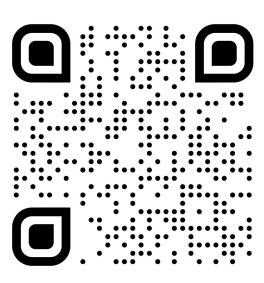


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#### These slides



https://bit.ly/open-schol-proj-JAC

