

Comparing the prevalence of statistical reporting inconsistencies in COVID-19 preprints and matched controls: A Registered Report

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Quality of COVID-19 research

- ▶ Studies on COVID-19 are published way faster (fast-track review procedures) and shared more often prior to publication
- ▶ *Does this “high speed” science negatively influence the quality of research?*

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- ▶ *Does this “high speed” science negatively influence the quality of research?*
- ▶ Factors that lower the likelihood of a finding being true (Ioannidis, 2005)
 - ▶ Financial and other interests
 - ▶ The extent to which a research field is hot → many scientific teams involved
- ▶ Only 41% of COVID-19 studies were of high methodological quality compared to 73% in the control group (Jung et al., 2020)

Quality of COVID-19 research: Statistical reporting

- ▶ Incorrect reporting of a statistical result might lower the confidence in a study
- ▶ Examples of statistical inconsistencies:
 - ▶ Percentage that does not match the events and total sample size $\rightarrow 7/100 \neq 5\%$
 - ▶ Odds ratio that is not in line with a 2x2 table

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Hypothesis:

The prevalence of statistical reporting inconsistencies differs between COVID-19 and matched non-COVID-19 preprints

Methods: Sample

- ▶ Population are all preprints on COVID-19 published between January 19, 2020 and January 31, 2021 on medRxiv and bioRxiv
- ▶ We focus on preprints, because
 - ▶ Play a central role in the dissemination of research
 - ▶ Can easily be located
- ▶ A stratified random sample is drawn with as strata:
 - ▶ Number of authors
 - ▶ Subject category
 - ▶ Date a preprint was published
- ▶ A matching non-COVID-19 preprint is selected to serve as a control group

- ▶ Statistics that will be extracted using a **protocol**:
 - ▶ Percentages vs. number of events and cases
 - ▶ Test properties → accuracy, sensitivity, specificity, etc.
 - ▶ Total sample size vs. subgroup sample sizes
 - ▶ Marginal values in frequency tables vs. values in cells
 - ▶ *P*-values vs. test statistics and degrees of freedom
 - ▶ Effect sizes based on dichotomous data vs. frequency table

Methods: Data extraction

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- ▶ Funding from Tilburg University to hire two research assistants
→ intended sample size 2,400 preprints

- ▶ Power analysis revealed that we can detect an odds ratio of 1.38 with 80% power

Methods: Analysis

- ▶ Automatic scripts check for statistical inconsistencies → detected inconsistencies will be verified by hand
- ▶ A logistic multilevel model will be fitted:
 - ▶ DV: Whether a statistical result is (in)consistent
 - ▶ IV: Whether a preprint is about COVID-19 or not
- ▶ Frequentist hypothesis test with $\alpha = 0.05$ as well as a Bayes factor
- ▶ Analysis will be repeated with control variables → number of authors and extracted statistics of a preprint, and date

- ▶ New form of publishing consisting of two stages:
 - ▶ Stage 1: Introduction and methods sections are reviewed
 - ▶ Stage 2: Start data collection, results and discussion sections are reviewed
- ▶ Proposal was accepted as Stage 1 RR at Royal Society Open Science
- ▶ Completing the paper should be easy :-) → running scripts and writing up results

Enriching preprints

- ▶ Posting reports about the consistency of statistical results in a preprint
- ▶ Adds value to preprints by notifying authors and readers
- ▶ Inconsistencies might be fixed before a preprint turns into a publication
- ▶ Research Master's student Hongwei Zhao developed these reports

Thank you for your attention

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Stage 1 Registered Report:

<https://osf.io/8zpmr/>