Lay Perceptions of Scientific Findings: The Risks of Variability and Lack of Consensus

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Introduction

The **credibility of scientific research** is in doubt, among lay consumer (Hornsey & Fielding, 2017) and scientist (Pashler & Wagenmakers, 2021) alike. Several tools have been proposed to combat this "crisis of confidence" (Ibid., p. 528). One such tool is the **crowd science** approach: "the organization of scientific research in open and collaborative projects" (Franzoni & Sauermann, 2014, p. 1). We focus on **crowdsourced data analysis**, also known as the **many analysts** or **multi-analyst** approach: giving the same dataset to different teams of scientists, who independently analyze it to answer the same research question and/or estimate a parameter of interest.

According to science reformers, crowd-scientific findings that tell a consistent story should garner more confidence in the conclusions and **increase public faith in science** (Silberzahn et al., 2018; Uhlmann et al., 2019). Here, we ask if we can find empirical evidence for these claims: **Does crowdsourcing data analysis improve the credibility of scientific research?**

Objectives

We explore **the effects of scientific findings emerging from a crowd of researchers** (vs. a typical research collaboration) **on lay consumers**' posterior beliefs, perceptions of credibility, confidence in an aggregate effect size estimate, and ratings of researcher bias, error, and discretion.

We compare the effects of providing a single, aggregate parameter estimate (the **single-analyst** condition) vs. multiple parameter estimates that (a) vary slightly and are all positive, leading to the same qualitative conclusion (the **multi-consistent** condition) or (b) vary widely and are of both signs, leading to differing qualitative conclusions (the **multi-inconsistent** condition). In all three conditions, the given estimates average to 5%.

Preregistered Hypotheses

Table 1: *Predicted direction of effects*

Measure	Multi-consistent	Multi-inconsistent
1. Posterior beliefs	+	−
2. Credibility	+	−
3. Confidence	−	−
4. Bias	−	+
5. Error	−	+
6. Discretion	No prediction	No prediction

Note. Table 1 indicates the predicted direction of effects for all outcomes, **compared to the single-analyst condition** and **controlling for prior beliefs** (a green plus/red minus indicates a positive/negative prediction, respectively). For example, we hypothesized that, compared to a single-analyst study and controlling for prior beliefs, ratings of credibility would be greater in the multi-consistent condition and lower in the multi-inconsistent condition.

Methods

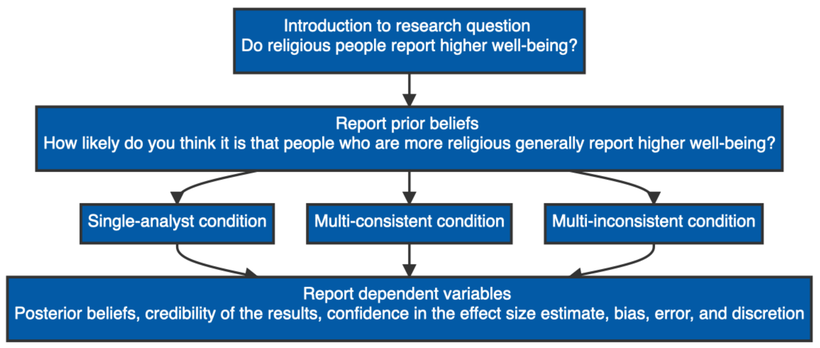
We run an experiment (N = 1,498) with **three conditions**

Single-analyst
A single, aggregate parameter estimate

Multi-consistent
Multiple parameter estimates with low variance and high consensus

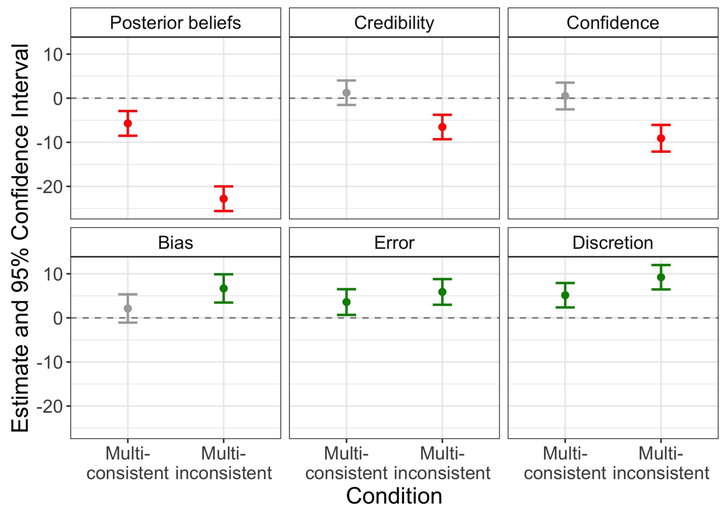
Multi-inconsistent
Multiple parameter estimates with high variance and low consensus

Experimental Design



Results

Figure 1: *Estimates (and 95% CIs) for all outcomes*



In line with our hypotheses, lay consumers of multi-analyst studies with **inconsistent** results

- Have lower posterior beliefs
- Find the results less credible
- Have less confidence in the average effect size estimate
- Believe the results are more likely to stem from bias
- Believe the results are more likely to stem from error

Contrary to our hypotheses, lay consumers of multi-analyst studies with **consistent** results

- Have lower posterior beliefs
- Believe the results are more likely to stem from error

We found **no significant effects** on

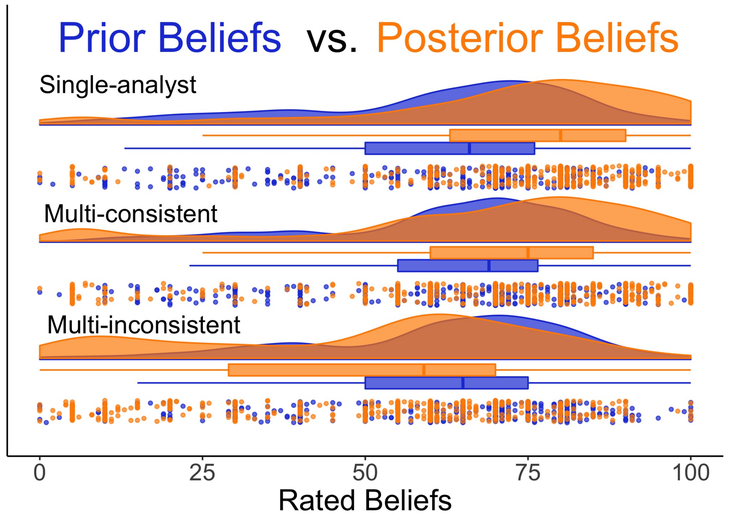
- Credibility of the results
- Confidence in the effect size estimate
- Ratings of bias

Exploratory results

For the additional **exploratory measure**, lay consumers of multi-analyst studies (both with **consistent** and **inconsistent** results)

- Perceive greater researcher degrees of freedom

Figure 2: *Distribution of prior and posterior beliefs by condition*



Discussion

Conclusions

- Crowdsourced data analysis has **many worthy uses**, but...
- **Variability** and **lack of consensus** may evoke negative responses

Future Directions

- Perceptions of **scientists**?
- **Science communication** and **communicating uncertainty**
- Other **suggestions**?

Open Science Statement

The preregistration, survey materials, data, and code that support the findings of this study are openly available on GitHub and the OSF.

- [Insert GitHub link here]
- [Insert OSF link here]