

# 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: a crowd of scientists independently analyzes the same dataset to answer the same research question or estimate and report 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 lay perceptions of scientific findings?**

### 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 lay consumers with a single 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, we emphasize that the given estimates average to 5%.

### Preregistered Hypotheses

Table 1: Predicted direction of effects

| Measure                               | Multi-consistent | Multi-inconsistent |
|---------------------------------------|------------------|--------------------|
| 1. Posterior beliefs                  | 🟢+               | 🔴-                 |
| 2. Credibility of the results         | 🟢+               | 🔴-                 |
| 3. Confidence in the precise estimate | 🔴-               | 🔴-                 |
| 4. Researcher bias                    | 🔴-               | 🟢+                 |
| 5. Researcher error                   | 🔴-               | 🟢+                 |
| 6. Researcher 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 parameter estimate

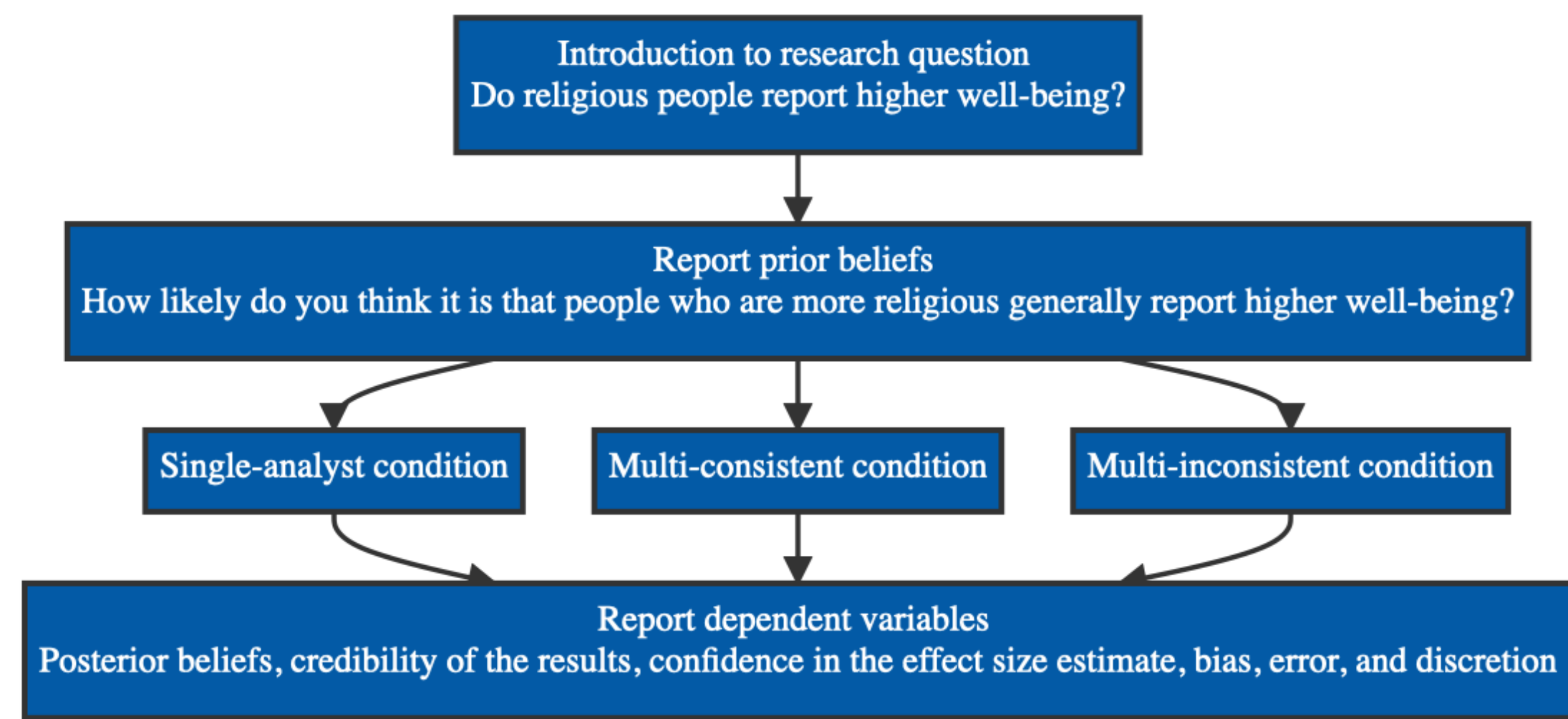
### Multi-consistent

Multiple crowd estimates with low variance and high consensus

### Multi-inconsistent

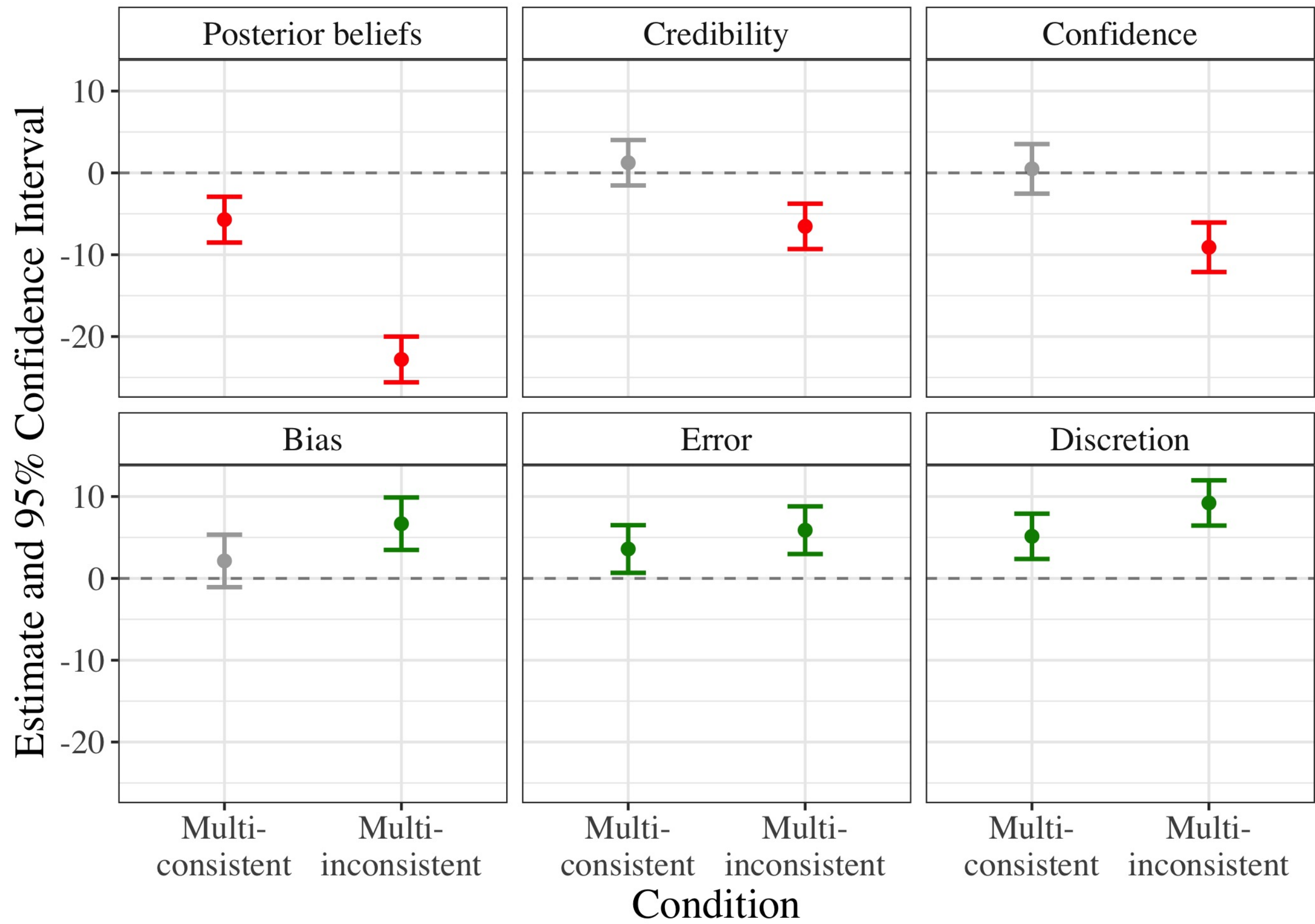
Multiple crowd estimates with high variance and low consensus

### Experimental Design



## Results

Figure 1: Estimates relative to the single-analyst condition



**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

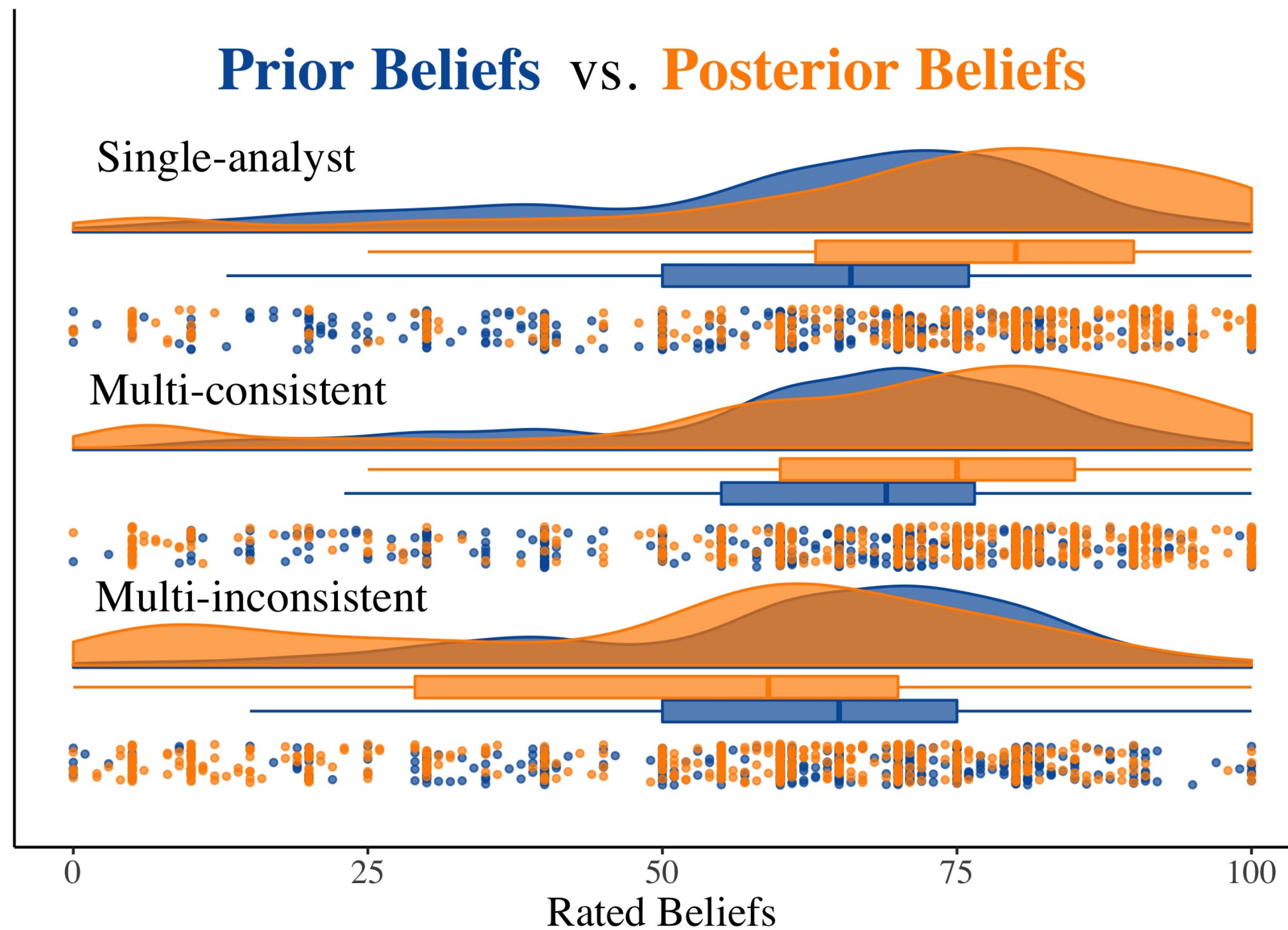
- ❓ Credibility of the results
- ❓ Confidence in the effect size estimate
- ❓ Ratings of bias

### 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

### Conclusion

- 🔗 Crowdsourced data analysis has **many worthy uses**, but...
- 💰 It's highly **resource-intensive**
- ⚠️ **Variability** and **lack of consensus** may evoke negative responses
- ❓ Surprisingly, even **multiple, consistent estimates may backfire**

### Future Directions

- 🧪 Perceptions of **scientists**?
- 🗣️ **Science communication** and **communicating uncertainty**

### 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]