Overview of transparency and reproducibility in social science research

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Filling in the gaps. An online workshop to promote, improve and implement tools for transparency and reproducibility in health economics research

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Economics (UG), Administration and Public Policy(Master) and currently a PhD student in HE. My research focuses on health inequalities. I am also interested in measuring health systems' efficiency in developing countries and costing health care interventions (HIV)

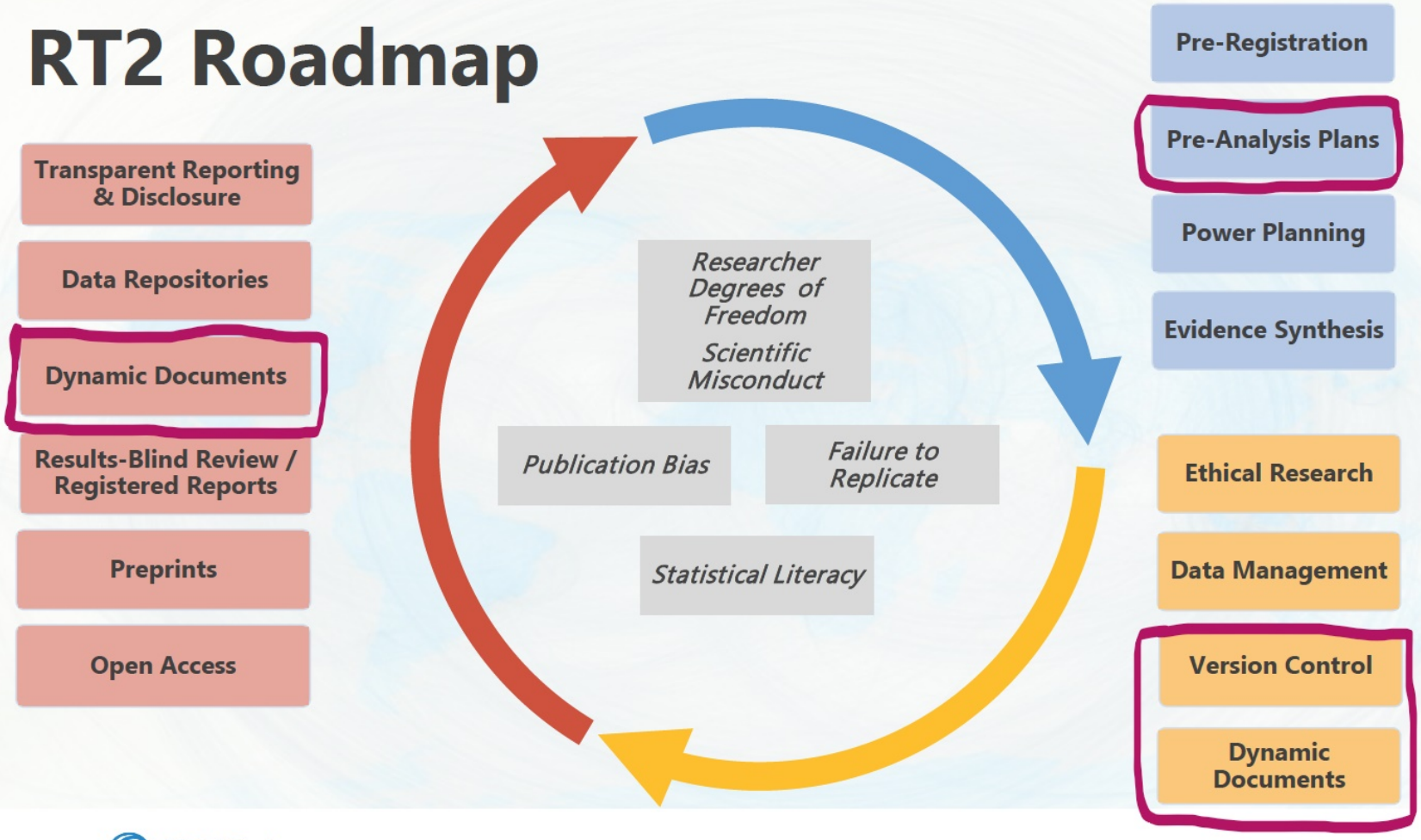
You?

- *Where are you based?*
- *What are your research interests?*

About this workshop

- Possible thanks to the funding received by the **Berkeley Initiative for Transparency in the Social Sciences (BITSS)** of the University of California
- Objective:
  - To *introduce* Health Economics scholars to the vast and growing movement about transparency and reproducibility in science

RT2 Roadmap


Transparent Reporting & Disclosure
Data Repositories
Dynamic Documents
Results-Blind Review / Registered Reports
Preprints
Open Access
Researcher Degrees of Freedom
Scientific Misconduct
Publication Bias
Failure to Replicate
Statistical Literacy
Pre-Registration
Pre-Analysis Plans
Power Planning
Evidence Synthesis
Ethical Research
Data Management
Version Control
Dynamic Documents

This workshop will cover...

- In these two days, we will introduce some of the most relevant tools of TR for HE:
  - What is transparency and reproducibility?
  - Pre-analysis plans
  - Version Control with Git
  - Dynamic Documents in Stata or R
  - Introductory talk about the *UK reproducibility network*

Why should we talk more about T&R?

nature

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nature › news feature › article

Published: 25 May 2016

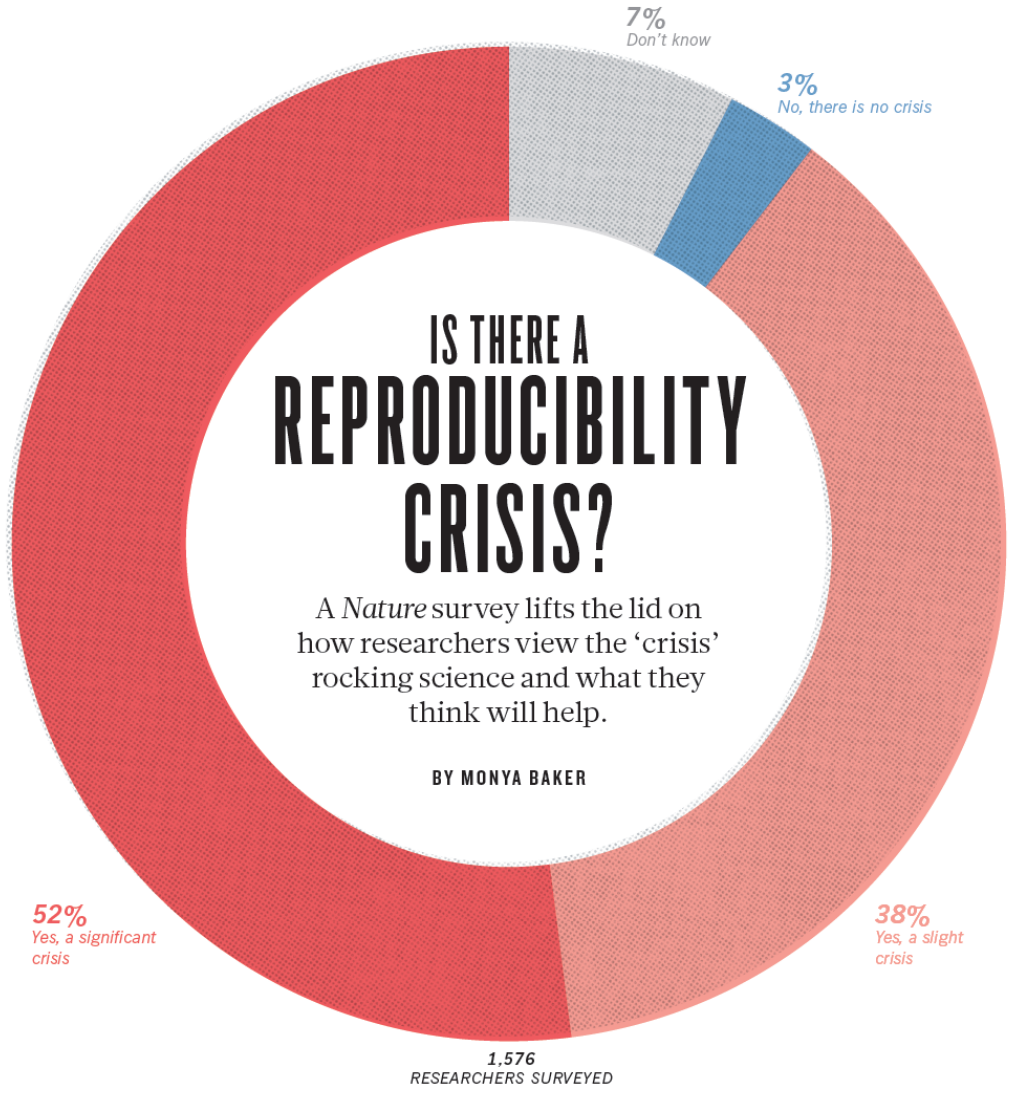
1,500 scientists lift the lid on reproducibility

Monya Baker

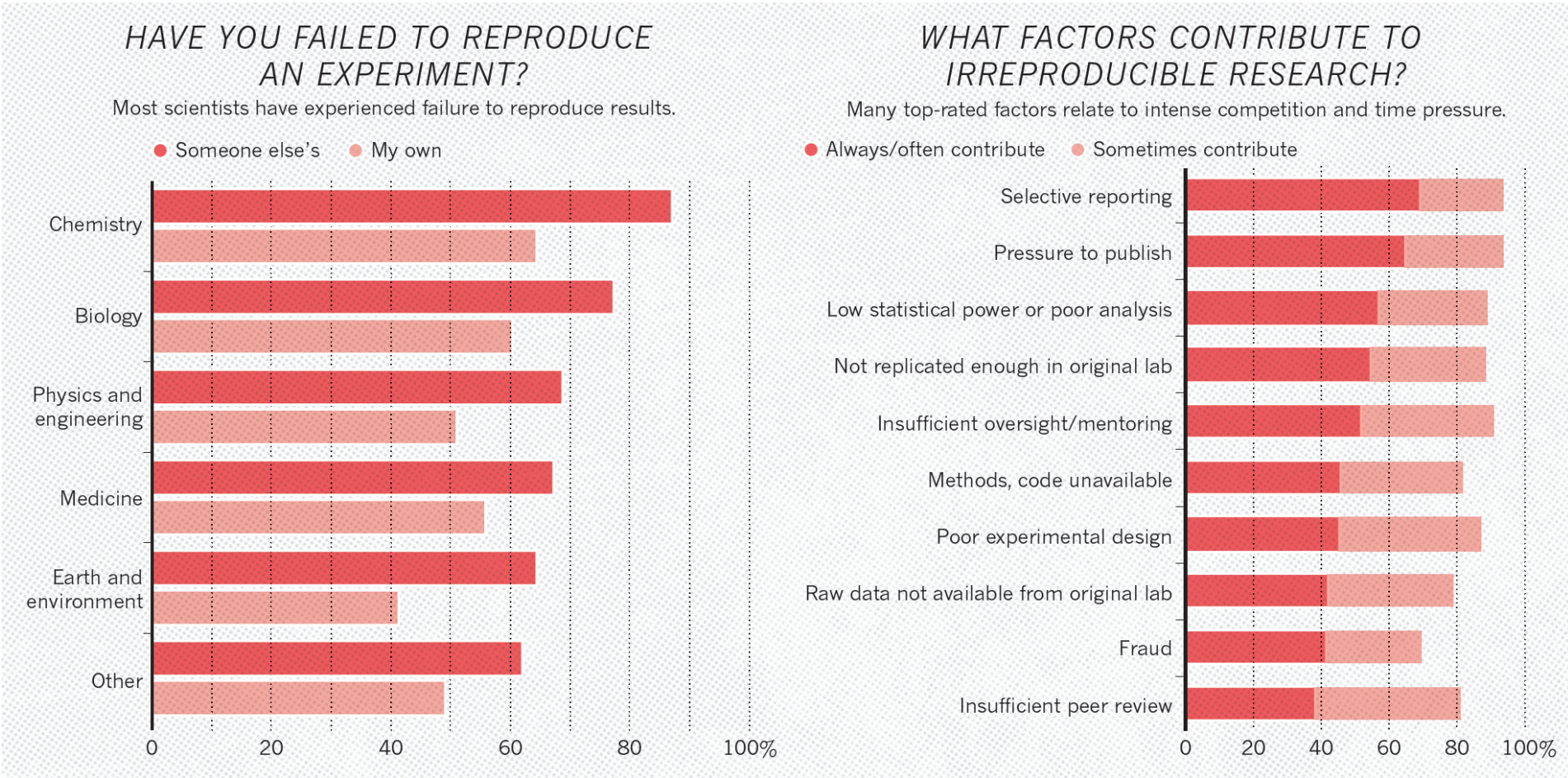
Nature **533**, 452–454 (2016) | Cite this article

14k Accesses | **1308** Citations | **3888** Altmetric | Metrics

This article has been updated



Figures from: Baker (2016)



Figures from: Baker (2016)

The T&R crisis and its consequences

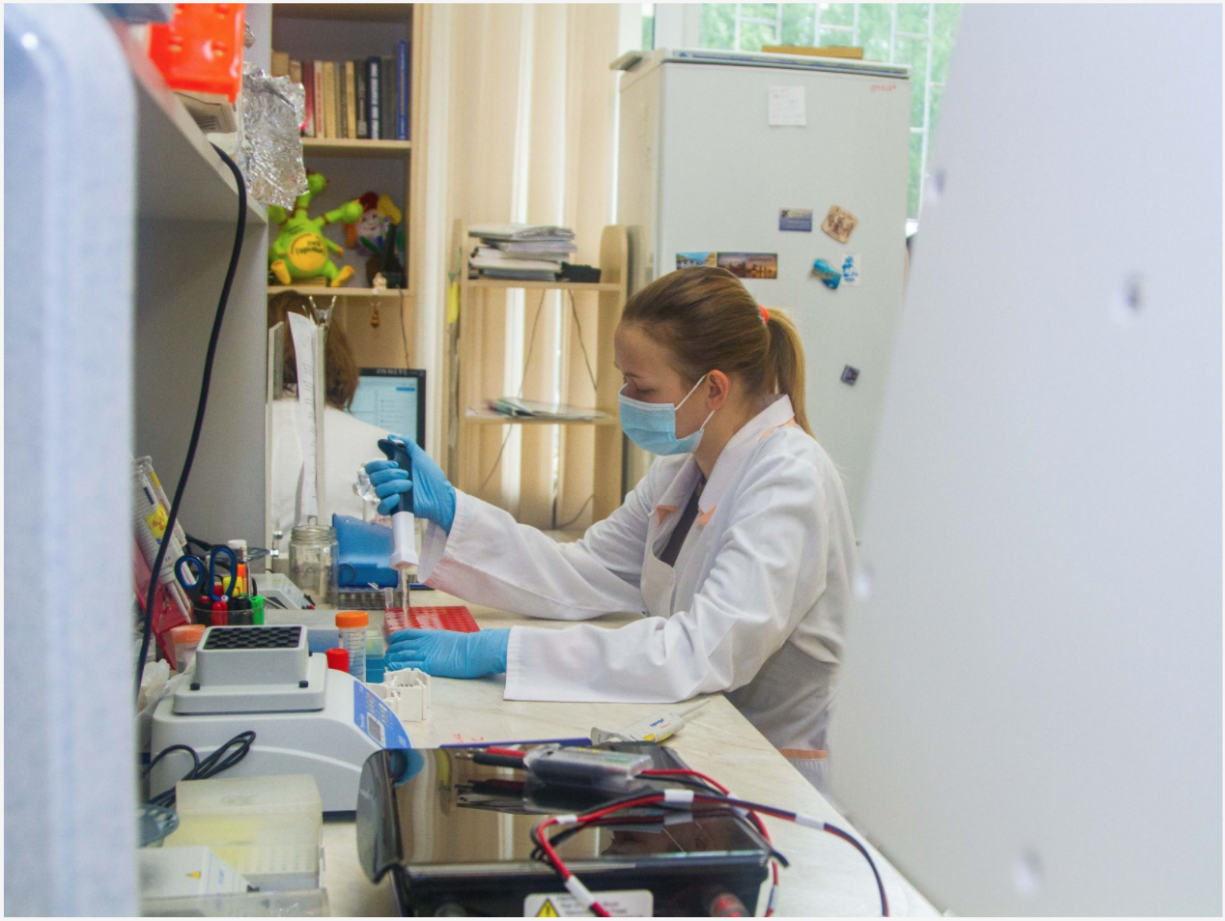
- Lack of transparency (registration) and reproducibility (code and data sharing) may prevent researchers from publishing in academic journals
- Opaquely conducted research may contribute to a **loss of trust** in research findings

For example...

MON 07 DEC 2020

> “Our findings are particularly worrying in terms of how distrust in scientists could negatively impact the uptake of vaccines.”

- Dr Orkun Saka



From: https://www.lse.ac.uk/News/Latest-news-from-LSE/2020/L-December/

'Public distrust in science and scientists during and following an epidemic can be a product both of individuals' backgrounds and of miscommunication by the scientific community. Such miscommunication, including conflicting statements by different experts, is more likely in crisis periods when the pressure to quickly produce and disseminate scientific findings is intense'(Eichengreen et al., 2021)

A motivating example

- On March 16, 2020 there was a salient controversy in the UK about the results and implications of an influential model that swayed politicians to declared a national lockdown

nature

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nature › news › article

NEWS | 08 June 2020

Critiqued coronavirus simulation gets thumbs up from code-checking efforts

Influential model judged reproducible — although software engineers called its code 'horrible' and 'a buggy mess'.

Dalmeet Singh Chawla

- Given the relevance of the decision, the academic community and opponents to the measure aimed to scrutinised the model
- **But**, this was not possible because **coding and data were not publicly available**
- This raised doubts about the *soundness* of the study among society
- Despite codes and data were published weeks after, *the potential success that the measure* could have had **was weakened**

Epidemic-induced distrust translates into lower compliance with health-related policies(Eichengreen et al., 2021)

Back to basics, science is...

- **Science is about testing hypotheses**, using inductive reasoning to create general rules (or theories) from the results, and then using those general rules to make further predictions or explanations of other evidence" (Spellman et al., 2018)
- The evidence, the methods of collecting and analysing that evidence, and the conclusions reached **should be open to the scrutiny** and evaluation of other scientists(Lupia, 2014)
- In this way, **scientific knowledge can be self-correcting**

Why? Because...

Open science represents a return to the core beliefs of how science *should* be practised, but updated for the present—by technology, by diversity, and by practices that explains **how** and **why** scientists can go wrong even when they have the best intentions(Spellman et al., 2018)

First: basic concepts

- **Open science:**
  Collection of actions designed to make scientific processes more transparent and results more accessible(Spellman et al., 2018)
- **Transparent research:**
  -Set of practices and tools used to *disclose all methods and data* behind an analysis
  -Hoces de la Guardia and Sturdy (2019), to be able to track the entire body of research:
  - using registration
  - disclosing key decisions in pre-analysis plans
  - facilitating the accumulation of knowledge

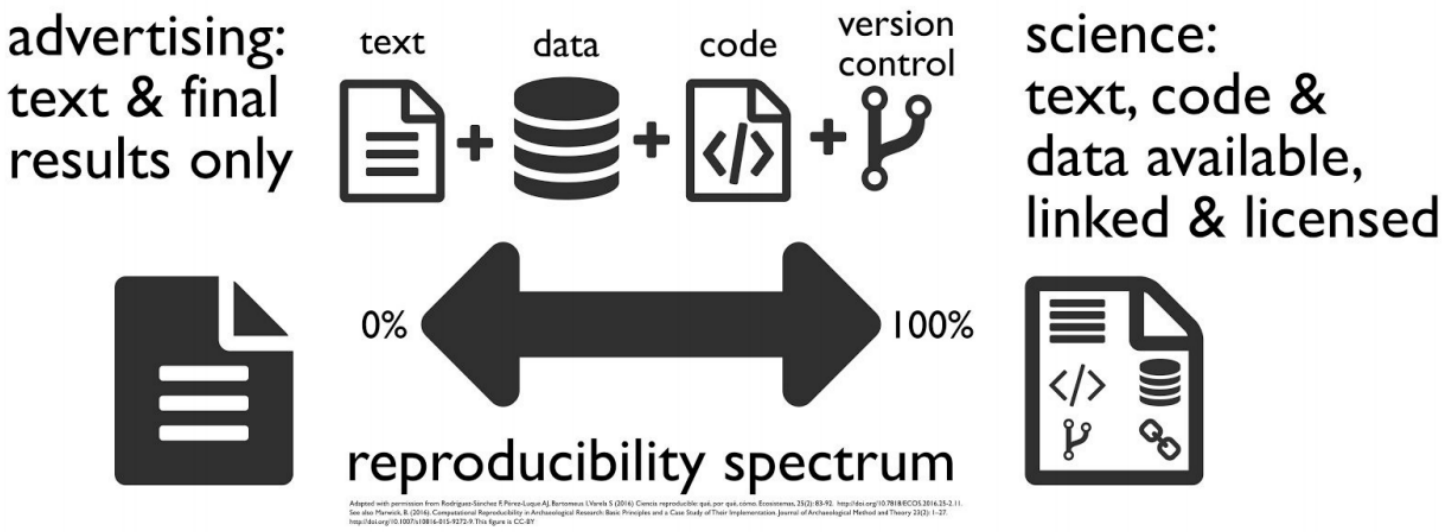
Replicability $\neq$ Reproducibility

- **Replicability** the practice of repeating a methodology using new data sets with similar characteristics (external validity)
- '**obtaining consistent results** across studies aimed at answering the **same scientific question**, each of which has obtained its **own data**' (Marwick et al., 2017)

- **Reproducibility**: means **obtaining consistent results using the same input data, computational steps, methods, and conditions of analysis** (Marwick et al., 2017).

Reproducible research

- The ability to **access** and **recreate** the final results of the analysis from raw data with minimal effort



Source: Marwick et al., 2017

Questionable Research Practices

Grey areas of research that are used to increase the likelihood of obtaining 'positive' results (John et al., 2012)

Examples:

- Not reporting all the variables analysed (*control variables*)
- Rounding off p-values (*almost "statistically significant"*)
- Excluding data after looking at the original results (*"it is not what I was expecting..."*)

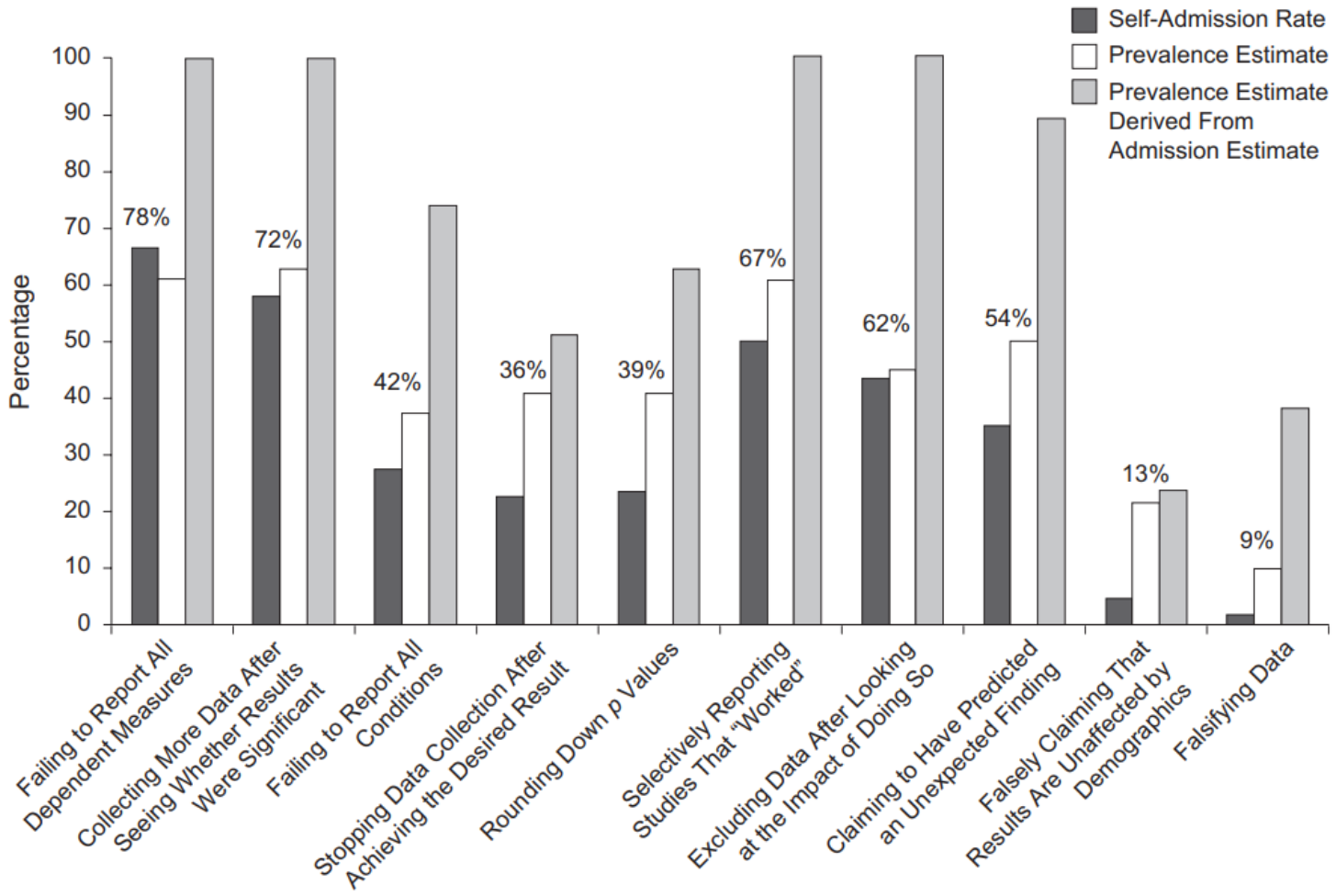


Fig. 1. Results of the Bayesian-truth-serum condition in the main study. For each of the 10 items, the graph shows the self-admission rate, prevalence estimate, prevalence estimate derived from the admission estimate (i.e., self-admission rate/admission estimate), and geometric mean of these three percentages (numbers above the bars). See Table 1 for the complete text of the items.

(John et al., 2012)

Publication bias

- When studies with positive results (those that reject the null hypothesis) have a much **higher likelihood of being published** than those with null results

Three reasons:

1. p-hacking: researchers might report a subset of analyses that produces positive results, and not report null or unintuitive results
2. editors or reviewers favouring papers with positive results over null results (HE vs Epidemiology)
3. "file drawer problem" (Rosenthal, 1979)

So...T&R practices

Transparent Research

- Study registration
- Pre-analysis plans (PAP)

Computationally Reproducible Research

- File management
- Version control strategy
- Dynamic documents
- Code and data sharing

T&R practices

- **Study registration and Pre-analysis plans (PAP)**
  -Potential solutions to publication bias
- **Version control strategy**
  -Aiming to create reproducible workflows
- **Dynamic documents**
  -*Open report*: code, narrative, and output are in one file, and the reader can expand each section to see every piece of the analysis. "One-click analysis" (Hoces de la Guardia, Grant, et al., 2021)
- **Code and data sharing**
  -Lack of *open code* (availability of all the files used in the analysis, including data cleaning, in a trusted public repository) may prevent researchers from publishing in academic journals
  (Hoces de la Guardia, Grant, et al., 2021)

Useful resources

- Best practices manual for economists
  https://github.com/garretchristensen/bestpracticesmanual
- Data Sharing and Archiving for Reproducibility
  https://labordynamicsinstitute.github.io/
  tutorial-data-sharing-archiving-2021/#/
- Template for Social Science replication packages
  https://zenodo.org/record/4319999#.YTjRQNP0m7r
- Rewarding transparency in HE via the MT Hood Diabetes Challenge Transparency Prize
  https://www.mthooddiabeteschallenge.com/transparency-prize
- Data and Code Availability Policy from the AEA
  https://www.aeaweb.org/journals/data/data-code-policy

Thanks!

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