

Research Transparency and Reproducibility

Introduction

Arnaud Vaganay

New Delhi, 28 April 2017

Hello Delhi!



Arnaud Vaganay
[arno]

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- Meta-research
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- arnaud@meta-lab.co

Hello Delhi!



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<https://meta-lab.co>

Hello Delhi!



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IN THE SOCIAL SCIENCES

- This presentation is sponsored by BITSS
- Catalyst programme
- Pre-event and post-event survey

<http://www.bitss.org>

Hello Delhi!

In today's workshop:

1. Setting the scene

2. Some tools for researchers

Research Transparency and Reproducibility

Part 1: Setting the scene

Arnaud Vaganay

New Delhi, 1 May 2017

1. Philosophy of RTR
2. What is RTR?
3. Is there a RTR problem?
4. Does it matter?
5. Is it all doom and gloom?

1. Philosophy of RTR

2. What is RTR?

3. Is there a RTR problem?

4. Does it matter?

5. Is it all doom and gloom?

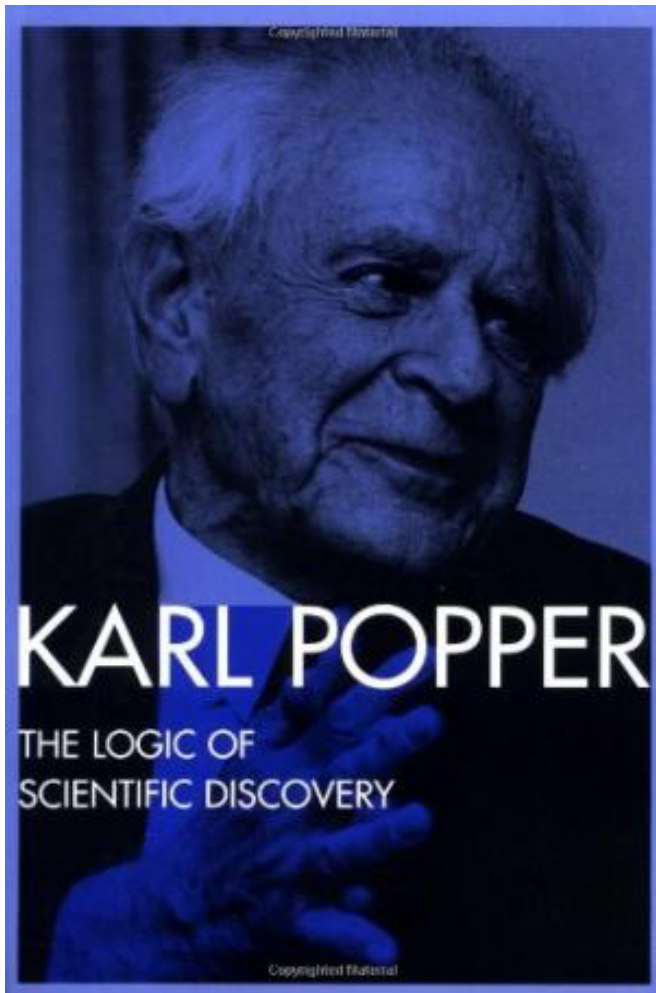
Philosophy

The philosophy underpinning RTR:

- Popper's *Falsifiability*
- Merton's *Norms of science*

Philosophy

The difference between a *scientific* claim and an *unscientific* claim is that only the former is falsifiable.



Philosophy

ROBERT K. MERTON

ON SOCIAL STRUCTURE
AND SCIENCE



Edited and with an Introduction by
PIOTR SZTOMPKA

THE HERITAGE OF SOCIOLOGY

Mertonian norms of science:

- Universalism
- Communalism
- Disinterestedness
- Organised skepticism

Philosophy

- Not all researchers subscribe to Merton's norm of communalism.
- However, a discussion of the pros and cons is beyond the scope of this workshop!

1. Philosophy of RTR

2. what is RTR?

3. Is there a RTR problem?

4. Does it matter?

5. Is it all doom and gloom?

what is RTR?

“The **replication** of scientific findings using independent investigators, methods, data, equipment, and protocols is the standard by which scientific claims are evaluated”.

Peng, R. (2009). Reproducible research and Biostatistics. *Biostatistics*, 10 (3): 405-408.

what is RTR?

- However, many studies cannot be fully replicated (lack of time or resources).
- Thus, there is a need for a minimum standard that can fill the void between full replication and nothing.
- “**Reproducibility** requires that data sets and computer code be made available to others for verifying published results and conducting alternative analyses”.

Peng, R. (2009). Reproducible research and Biostatistics. *Biostatistics*, 10 (3): 405-408.

what is RTR?

Reproducibility requires:

- A certain order in how we keep our files
- A common agreement on how files should be ordered

what is RTR?

- **Transparency** is about logic and motivations.
- why did I perform this analysis?
 - Because I am testing a theory
 - Because the results are convenient

(My own definition)

what is RTR?

- Reproducibility has to do with the 'how'
- Transparency has to do with the 'why'

1. Philosophy of RTR

2. What is RTR?

3. Is there a RTR problem?

4. Does it matter?

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Is there a RTR problem?

Is research reproducible?



Over half of psychology studies fail reproducibility test

Largest replication study to date casts doubt on many published positive results.

Monya Baker

27 August 2015

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Don't trust everything you read in the psychology literature. In fact, two thirds of it should probably be distrusted.

In the biggest project of its kind, Brian Nosek, a social psychologist and head of the Center for Open Science in Charlottesville, Virginia, and 269 co-authors repeated work reported in 98 original papers from three psychology journals, to see if they independently came up with the same results.



Is there a RTR problem?

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About 40% of economics experiments fail replication survey

By [John Bohannon](#) | Mar. 3, 2016 , 2:00 PM

When a massive replicability study in psychology was published last year, the results were, to some, shocking: 60% of the 100 experimental results failed to replicate. Now, the latest attempt to verify findings in the social sciences—this time with a small batch from experimental economics—also finds a substantial number of failed replications. Following the exact same protocols of the original studies, the researchers failed to reproduce the results in about 40% of cases.

"I find it reassuring that the replication rate was fairly high," says Michael L. Anderson, an economist at the University of California, Berkeley, not involved with the study. But he notes that most of the failures came from studies using a 5% "p value" cut-off for statistical significance, suggesting "what some realize but fewer are willing to discuss: The accepted standard of a 5% significance level is not sufficient to generate results that are likely to replicate."

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515



DAVIDE BONAZZI

Rigorous replication effort succeeds for just two of five cancer papers

Is there a RTR problem?

Is research transparent?



Is there a RTR problem?

nature International weekly journal of science

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Social sciences suffer from severe publication bias

Survey finds that 'null results' rarely see the light of the day.

[Mark Peplow](#)

28 August 2014

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Is there a RTR problem?

How much do scientists know
about this?

what do they think of this?

Is there a RTR problem?

nature

International weekly journal of science

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NATURE | NEWS FEATURE

1,500 scientists lift the lid on reproducibility


Survey sheds light on the 'crisis' rocking research.

Monya Baker

25 May 2016 | Corrected: 28 July 2016

Is there a RTR problem?

How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data

Daniele Fanelli 

Published: May 29, 2009 • <https://doi.org/10.1371/journal.pone.0005738>

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Abstract

Introduction

Abstract

Is there a RTR problem?



Houston, we have a problem

1. Philosophy of RTR

2. What is RTR?

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Does it matter?

Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

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Modeling the Framework
for False Positive
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Abstract

Summary

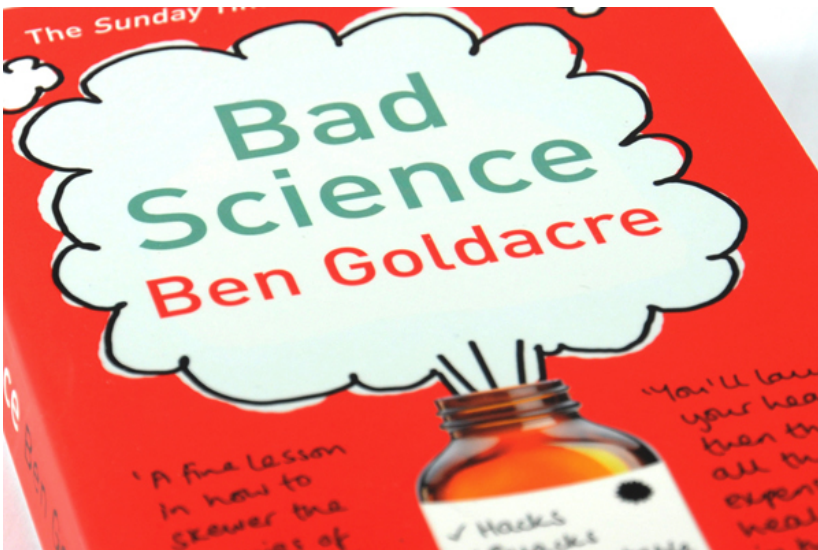
There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among

Related PLOS Articles

[Why Current Publication Practices May Distort Science](#)

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Does it matter?



News > Science

Study reveals that a lot of psychology research really is just 'psycho-babble'

Of 100 studies, more than half could not be reproduced using the same method

Steve Connor | @SteveAConnor | Thursday 27 August 2015 18:00 BST | 0 comments



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Scientists like to think of science as self-correcting. To an alarming degree, it is not



From the print edition | Briefing >

Oct 18th 2013



The Washington Post

Politics

How a highly cited same-sex marriage study fell apart under scrutiny

Does it matter?



Does it matter?

Paul Glasziou and Iain Chalmers: Is 85% of health research really “wasted”?

📅 January 14, 2016



Our estimate that 85% of all health research is being avoidably “wasted” [[Chalmers & Glasziou, 2009](#)] commonly elicits disbelief.



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4

Our own first reaction was similar: “that can’t be right?” Not only did 85% sound too much, but given that \$200 billion per year is spent globally on

health and medical research, it implied an annual waste of \$170 billion. That amount ranks somewhere between the GDPs of Kuwait and Hungary. It seems a problem worthy of serious analysis and attention. But how can we estimate the waste?

Let’s break up the 85% figure by its components. The easiest fraction to understand is the fraction wasted by failure to publish completed research. We know from follow up of registered clinical trials that about 50% are

Does it matter?

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Climate change is present danger, US warns

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German research agencies condemn animal-rights attack on neuroscientist

NEWS BLOG

Global scientific output doubles every nine years

07 May 2014 | 16:46 GMT | Posted by [Richard Van Noorden](#) | Category: [Policy](#), [Publishing](#)

1. Philosophy of RTR
2. What is RTR?
3. Is there a RTR problem?
4. Does it matter?
- 5. Is it all doom and gloom?**

Is it all doom and gloom?

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nature
human behaviour




Altmetric: 2,154 Views: 56,738

[More detail >>](#)

Perspective | [OPEN](#)

A manifesto for reproducible science

Marcus R. Munafò , Brian A. Nosek, Dorothy V. M. Bishop, Katherine S. Button, Christopher D. Chambers, Nathalie Percie du Sert, Uri Simonsohn, Eric-Jan Wagenmakers, Jennifer J. Ware & John P. A. Ioannidis

Nature Human Behaviour **1**,
Article number: 0021 (2017)
doi:10.1038/s41562-016-0021
[Download Citation](#)

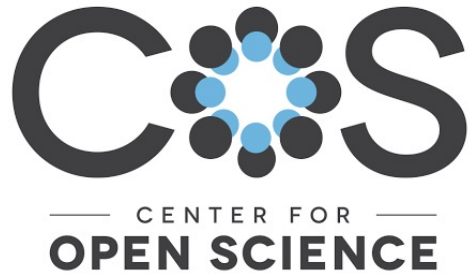
Published online: 10 January 2017

Is it all doom and gloom?

Solutions:

- Registered Reports
- Involvement of methodologists in research
- Disclosure of conflicts of interest
- Open data, materials, software
- Pre- and post-publication peer review
- Funding replication studies

Is it all doom and gloom?




Meta-Lab



Is it all doom and gloom?

Get Funding

Policy Window 

Development Priorities Window 

Thematic Window 

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Systematic Review Grants 

Replication Window 

Data Preparation and Release Window

Bursary Programme

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Replication Window

The replication window funds internal replication studies of impact evaluations of development interventions.

This funding mechanism aims to increase the incentives for conducting replication and to improve the quality of evidence available for programme and policy design. To this end, the replication window funds researchers to conduct replication studies, quality assures them, and promotes good practices around communication and data availability. Accepted replications are eligible for publication in the 3ie [Replication Paper Series](#).



Is it all doom and gloom?



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Research Transparency MOOC [Education](#) [Video Library](#)



Demand is growing for evidence-based policy making, but there is also growing recognition in the social science community that limited transparency and openness in research have contributed to widespread problems. With this course, you can explore the causes of limited transparency in social science research, as well as tools to make your own work more open and reproducible.

Free Statistical Consulting [Education](#) [statistics](#)



The Center for Open Science offers free statistical and methodological consulting (sometimes with the help of BITSS). We answer questions and provide training on open and reproducible tools, methodologies, and workflows.

Research Transparency and Reproducibility

Part 2: Tools for researchers

Arnaud Vaganay
New Delhi, 1 May 2017

1. How did we get there?

2. Enabling tools:

- PAPS
- Workflow diagrams
- Collaboration software
- Reporting guidelines
- ... And more!

1.How did we get there?

2.Enabling tools:

- PAPS
- workflow diagrams
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- ... And more!

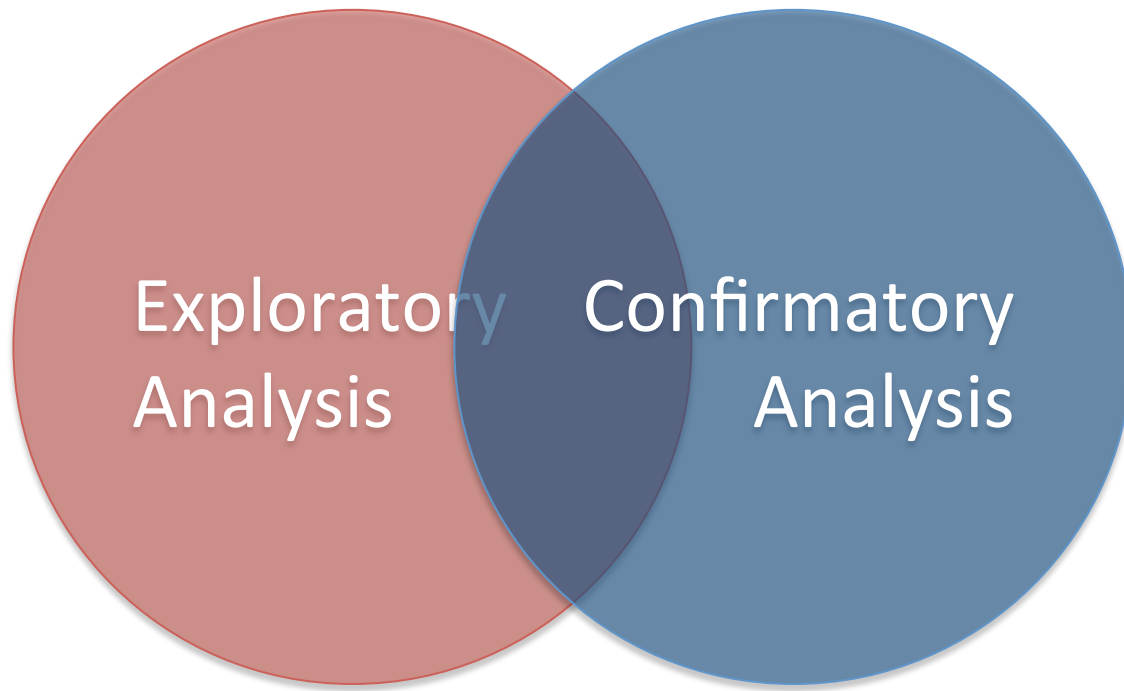
How did we get there?

Three reasons:

1. Cognitive biases
2. Insufficient project management skills
3. Questionable statistical practices (not addressed today)

How did we get there?

(1) Cognitive biases:



How did we get there?

- Research needs both *confirmatory* and *exploratory* analyses;
- But these analyses must be performed separately, given the risks of:
 - Apophenia
 - Confirmation bias
 - Hindsight bias

How did we get there?



Exploratory
Analysis



Confirmatory
Analysis

How did we get there?

- Researchers must formulate their hypothesis before doing any data analysis.
- HARKing: Hypothesizing After the Results are Known.

How did we get there?

(2) Project management:

- Research projects involve a large number of actors;
- Often unclear as to exactly what it is they are researching;
- Often working in different locations;
- Rarely sharing the exact same standards;
- Vast number of files and versions of the same file.

How did we get there?

A good filing system is one whereby an external researcher can independently retrieve a file in a given repository.

1. How did we get there?

2. Enabling tools:

- **PAPS**
- workflow diagrams
- Collaboration software
- Reporting guidelines
- ... And more!

Pre-Analysis Plan: Title of the study*

Author's name[†]

Date of latest draft

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RIDIE Study Registration Fields List

Below are the fields that are collected when registering a study with RIDIE. You can use this list to help you prepare longer text responses before beginning your online registration. Note, however, that you will not have to fill out all the fields shown. Many questions will be skipped based on the type of study and prior responses, and many are optional. This will become clearer once you begin your actual online study registration at RIDIE.

General

Study Overview

Title

Study ID

Initial Registration Date

Last Update Date

<http://ridie.3ieimpact.org/index.php?r=site/downloadBlankStudy>

A PAP does not need to be published/registered but doing so has key advantages:

- Additional incentive to do it well;
- Get feedback;
- Enhances credibility of the study;
- Signals that work is on-going;
- Might trigger new projects/collaborations

when register?

- Preferably before data collection
- Definitely before data analysis

where register?

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Study Title	Investigator	Status	Registered On ▾	Actions
The effect of community-based parental education sessions, playgroups, and home visits on early childhood development in the Philippines	Jonathan Seiden	Ongoing	4.21.2017	View Download
IMPACT EVALUATION OF THE HYDROAGRICULTURAL DEVELOPMENT PROJECT OF M'BAHIAKRO IN COTE D'IVOIRE ON HOUSEHOLD INCOME, FOOD SECURITY AND EMPLOYMENT.	Souleymane Sadio Diallo	Ongoing	4.19.2017	View Download
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Combined Protocol for Acute Malnutrition Study	Jeanette Bailey	Ongoing	4.18.2017	View Download

Research Design Tool



Page 1 of 8

Note: This is a beta version of this tool. Questions and comments are welcome!

How does this form work?

This form guides a conversation with a potential partner that is considering doing an RCT. The questions will help you obtain information to decide evaluation. After you submit the form, you will receive a PDF with the questions and your responses, which can feed into a first draft of an evaluation o

[Click here for an example of a filled-out Research Design Tool.](#)

During the conversation, don't forget that:

<http://egap.org/content/research-design-tool>



REGISTRATION GUIDELINES

Please review these instructions before beginning a trial registration.

Accounts

You will need a valid account to register a trial. To create an account go to the [Sign Up](#) page.

Trial Registration

Once you have a valid account, you can register a trial at the [Trial Registration](#) page. The person registering the trial is considered to be the primary principal investigator (PI). For studies with additional PIs, there are additional fields to enter their names, emails and affiliations. Email addresses are hidden from public view.

Required Information

To register a trial, you must complete the following fields:

- Trial Title
- Country (At least one)

<https://www.socialscienceregistry.org/site/instructions>

Additional benefits of PAPs:

- Keep studies simple/focused;
- Better time management;
- Does NOT prevent from conducting exploratory analyses.

1. How did we get there?

2. Enabling tools:

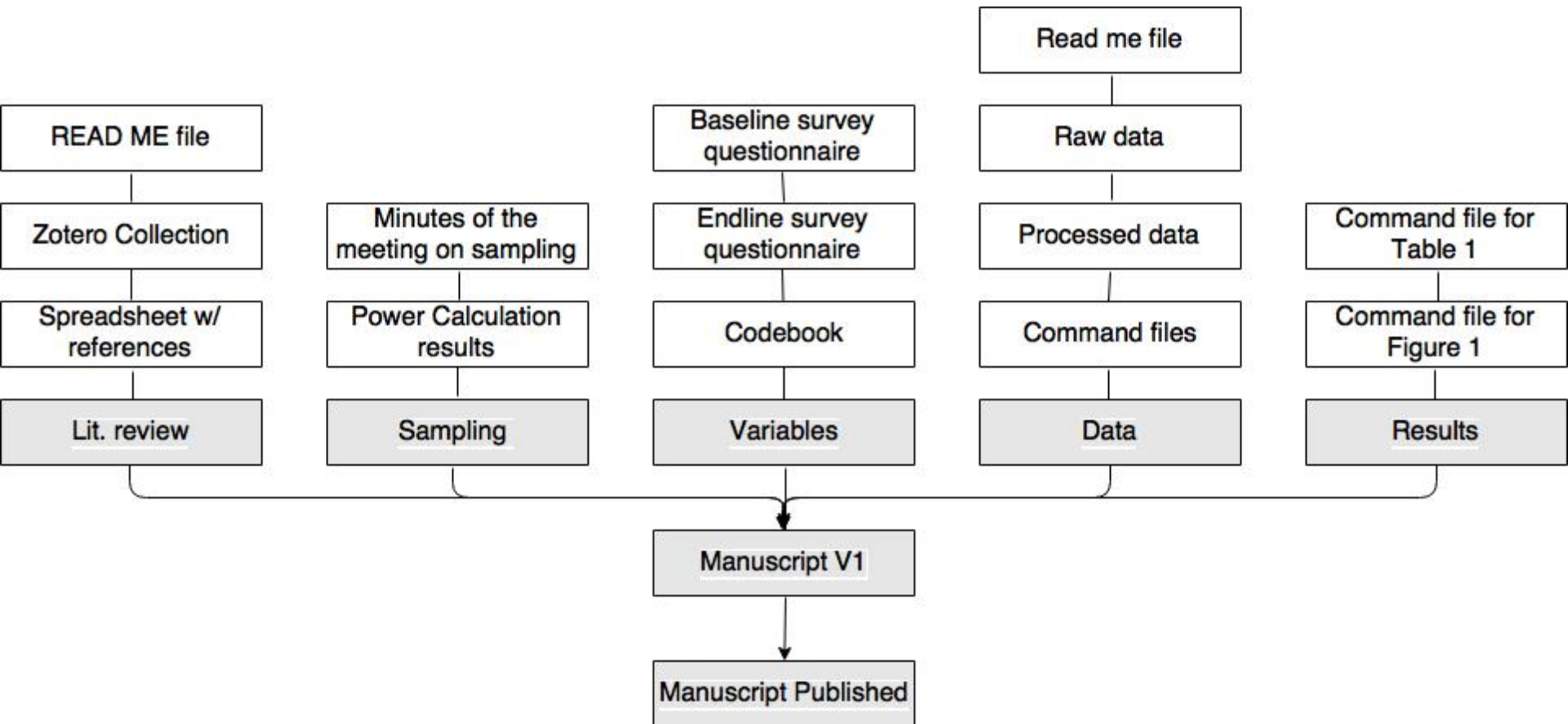
- PAPS
- **workflow diagrams**
- Collaboration software
- Reporting guidelines
- ... and more!

workflow diagrams

workflow diagrams are:

- The comprehensive list of all files created in a given study;
- How these files relate to each other.

workflow diagrams



workflow diagrams

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The DRESS Protocol

IN THIS SECTION

[SPECIFICATIONS](#)[PROCESS](#)[DEMO PROJECT](#)[OPEN SCIENCE FRAMEWORK](#)

The DRESS (Documenting Research in the Empirical Social Sciences) Protocol is a set of standards for replication documentation that embodies the same principles that underlie the TIER Protocol. The DRESS Protocol, however, is tailored to suit the purposes of professional researchers, rather than for use by students during their research training. Some elements of the TIER Protocol that serve purely pedagogical purposes are omitted from the DRESS Protocol, and other elements that are typically not relevant to student projects have been added.

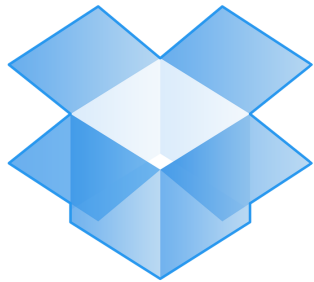
<http://www.projecttier.org/tier-protocol/dress-protocol/>

1. How did we get there?

2. Enabling tools:

- PAPS
- workflow diagrams
- **collaboration software**
- Reporting guidelines
- ... and more!

collaboration software



Dropbox



Pure



Google Drive



The
Dataverse
Project



collaboration software

Open Science Framework

A scholarly commons to connect the entire research cycle



collaboration software

- A free, open source web application that connects and supports the research workflow
- Researchers use the OSF to collaborate, document, archive, share, and register research projects, materials, and data

collaboration software

Quick demo:

<https://osf.io>

collaboration software

Main features of the OSF:

- Access to files can be restricted or public;
- Keeps track of changes to files;
- Compatible with Dropbox, Mendeley, Github, etc.
- Also include a pre-registration service

collaboration software

A 60-min tutorial on the OSF:

<https://www.youtube.com/watch?v=YBFUV1or08A>

1. How did we get there?

2. Enabling tools:

- PAPS
- workflow diagrams
- Collaboration software
- **Reporting guidelines**
- ... And more!

Reporting guidelines



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Library for health research reporting

The Library contains a comprehensive searchable database of reporting guidelines and also links to other resources relevant to research reporting.



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guidelines



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guideline to use?



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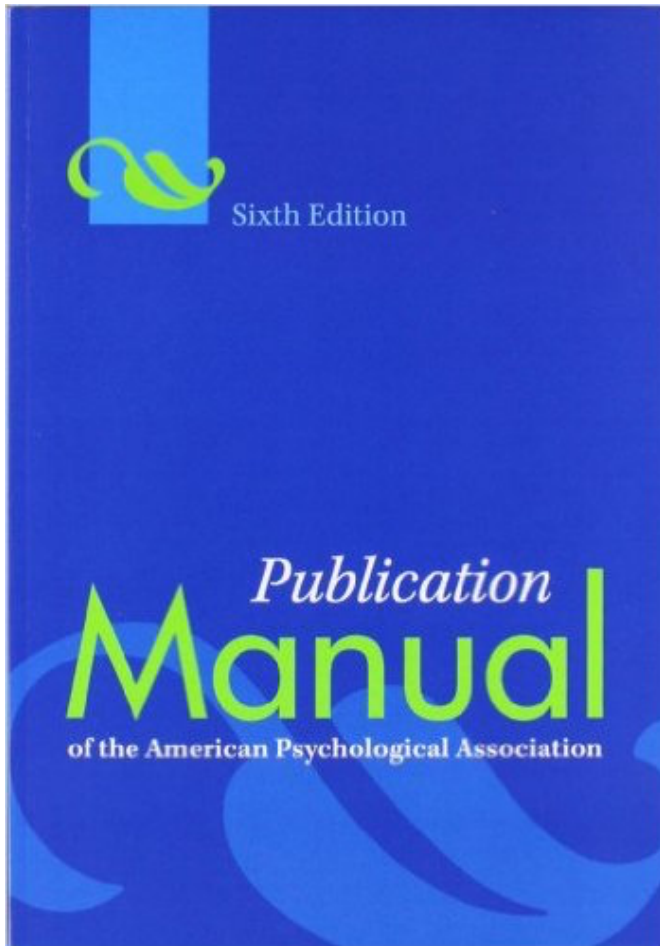
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Reporting guidelines

In particular for the presentation of statistical results

Statistical reporting is often incomplete



1. How did we get there?

2. Enabling tools:

- PAPS
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Publication