# Transparency and Reproducibility in Economics: Lessons learned from 1,000 papers

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*Cleveland, OH – 2023-03-31*

The opinions expressed in this talk are solely the authors, and do not represent the views of the U.S. Census Bureau, the American Economic Association, or any of the funding agencies.


# 3 Lessons (and many solutions)

- Lesson 1: Computational empathy
- Lesson 2: Data acumen
- Lesson 3: Role of institutions


# Let me expand that a bit…


# For students and researchers

0. *Do not necessarily learn from previous papers*
1. Have computational empathy for …
2. Track data whenever used
3. Learn the basic … of programming
4. Learn to automate
5. Preserve it all (and version it too)

# For institutions

*(departments, schools, libraries, IT, universities)*

1. Offer training in adapted tools
2. Highlight appropriate community or university sites
3. Provide streamlined access to some frequently used (open/commercial) tools


# For faculty

1. Encourage students to learn skills you don't know
2. Demand reproducibility when reviewing
   (*articles, theses, intermediate reports from students, etc.*)
3. Incentivize reproducibility


# A bit of background

# AMERICAN ECONOMIC ASSOCIATION

### American Economic Review

The *American Economic Review* is a general-interest economics journal. Established in 1911, the *AER* is among the nation's oldest and most respected scholarly journals in economics.

### American Economic Review: Insights

*AER: Insights* is designed to be a top-tier, general-interest economics journal publishing papers of the same quality and importance as those in the *AER*, but devoted to publishing papers with important insights that can be conveyed succinctly.

### Journal of Economic Literature

The *Journal of Economic Literature (JEL)*, first published in 1969, is designed to help economists keep abreast of and synthesize the vast flow of literature.

### Journal of Economic Perspectives

The *Journal of Economic Perspectives (JEP)* fills the gap between the general interest press and academic economics journals.

### American Economic Journal: Applied Economics

*American Economic Journal: Applied Economics* publishes papers covering a range of topics in applied economics, with a focus on empirical microeconomic issues.

### American Economic Journal: Economic Policy

*American Economic Journal: Economic Policy* publishes papers covering a range of topics, the common theme being the role of economic policy in economic outcomes.

### American Economic Journal: Macroeconomics

*American Economic Journal: Macroeconomics* focuses on studies of aggregate fluctuations and growth, and the role of policy in that context.

### American Economic Journal: Microeconomics

*American Economic Journal: Microeconomics* publishes papers focusing on microeconomic theory; industrial organization; and the microeconomic aspects of international trade, political economy, and finance.

# AEA Data & Code Availability Policy (2019)

- It is the policy of the American Economic Association to publish papers only if the data used in the analysis are **clearly and precisely** documented and **access to the data and code is clearly and precisely documented and is non-exclusive to the authors.**
- Authors of accepted papers that contain empirical work, simulations, or experimental work must **provide**, **prior to acceptance**, the data, programs, and other details of the computations **sufficient to permit replication**, as well as **information about access to data and programs.**

# Action: Reproducibility Check

Social Science Data Editors

## Data and Code Guidance by Data Editors

Guidance for authors wishing to create data and code supplements, and for replicators.

### Verification guidance

On this page:



#### Overview

This document describes

- what authors should check before providir journals
- what verifier teams should check for in the to them for the purpose of verification

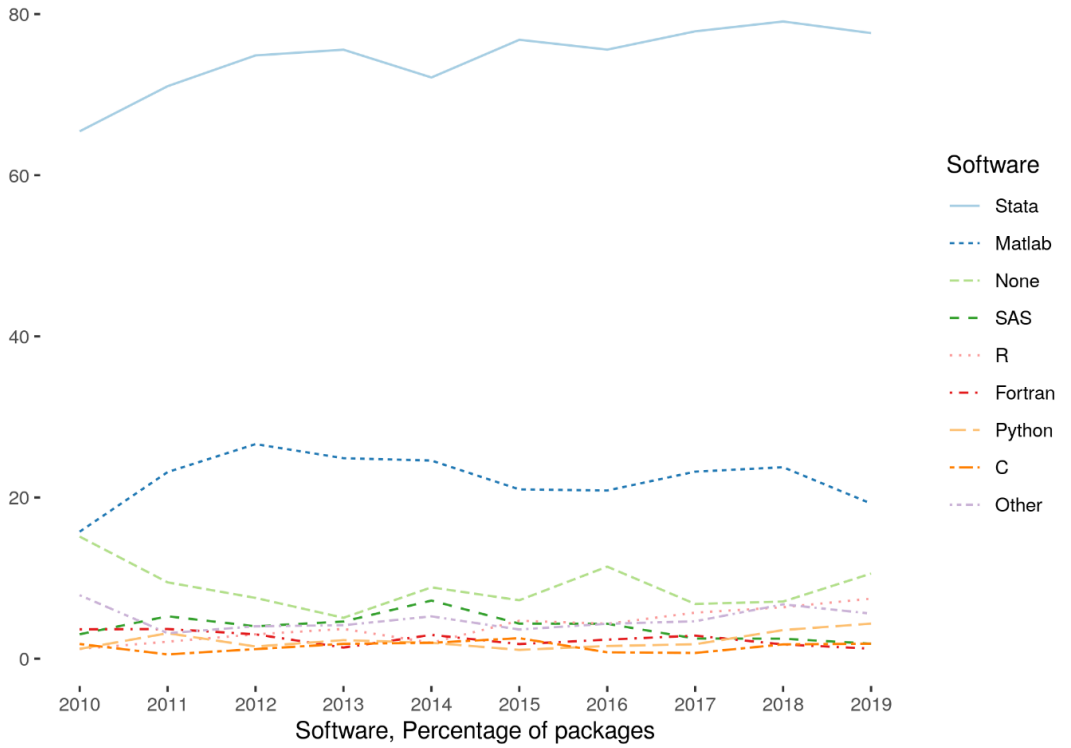
# Stats on reproduced articles

Since July 16, 2019, the AEA Data Editor team has conducted reproducibility assessments

- for ~**1500 manuscripts** (full papers)

# Very little diversity in software

- **Stata** is the most popular statistical software in the journals of the AEA (**72.96%** of all supplements, 2010-2019)
- followed by **Matlab** (**22.45%**)



# Defining “reproducible research”

“Reproducibility” refers to the ability of a researcher to duplicate the results of a prior study using the **same materials** and **procedures** as were used by the original investigator.

Bollen et al. 2015. “Social, Behavioral, and Economic Sciences Perspectives on Robust and Reliable Science.” National Science Foundation.https://www.nsf.gov/sbe/AC_Materials/SBE_Robust_and_Reliable_Research_Report.pdf.

# Lessons?


# Observation 0

Researchers don't…

- Re-run their code before submitting
- Don't streamline (automate) enough
- Are not careful about how they document data sources
- Fail to curate their own data

# Lessons!

# Computational empathy


# Lesson 1: Computational empathy

In the words of the slogan popularized by Buckheit and Donoho (1995),

> ***"a scientific publication is [...] merely advertising of the scholarship: [...] the complete software development environment and the complete set of instructions which generated the figures."***


# Lesson 1: Computational empathy

Put yourself in the position of the reader of the research compendium:

- Can they understand those instructions?
- Under what premises/ shared common knowledge?
- What might they assume about the computing environment?
- How concise or diffuse are the instructions?

# Lesson 1: Computational empathy

## Potential readers

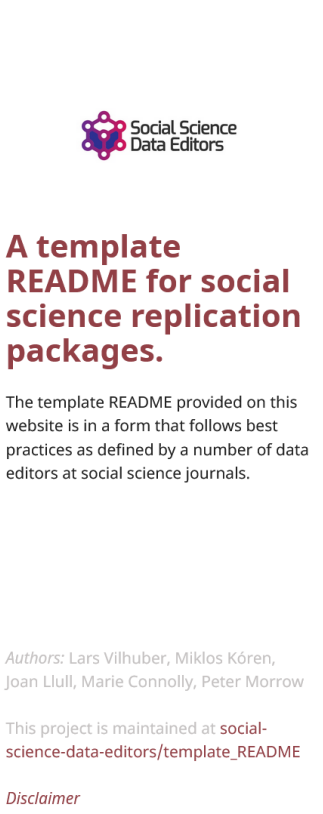
- **You** *(in 4 years, between prepping 2 new courses, an R&R, a new child, and tenure coming up in 2 years)*
- Your RA *(in 4 years, because you are… see above)*
- Your future readers who will cite you *(in 4-10 years, who may want to extend or replicate your study, but won't if it is too complex)*

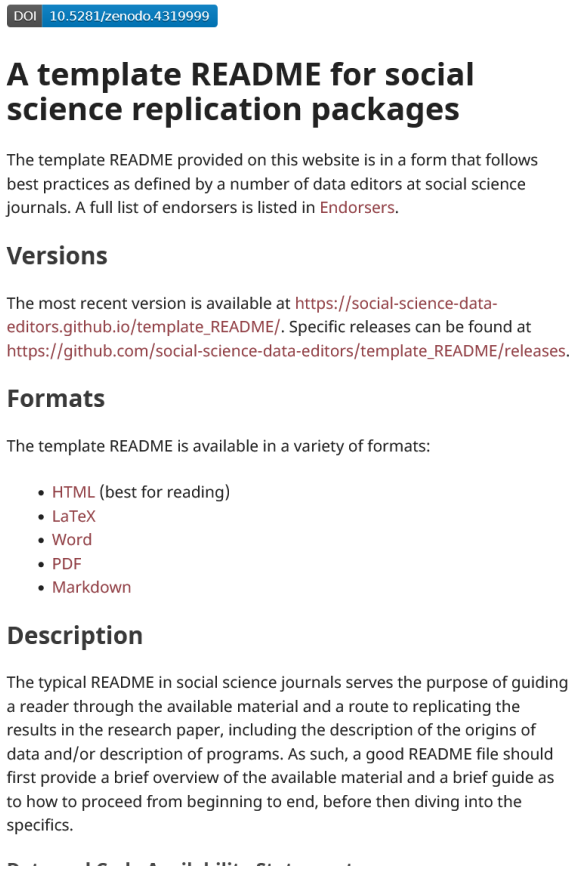

# Lesson 1: Computational empathy

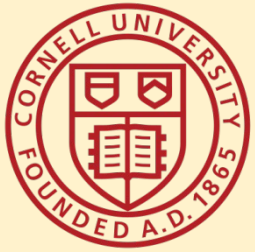
= “Pity the poor replicator”

# 1. Computational empathy

- *Focal reader:* your next RA in 4 years
- *Interaction*: you hand them your README, but don't have time to go through all the details…
- *Budget constraint*: It shouldn't take too many RA hours
- *Time constraint*: It shouldn't take more than 1 week to "get it"






# Solution 1: Computational Empathy

Use the Social Science Data Editors'

**template README**

https://doi.org/10.5281/zenodo.4319999

# Data acumen

# Data acumen

"the ability to understand data, to make good judgments about and good decisions with data, and to use data analysis tools responsibly and effectively"

National Academies of Sciences, Engineering, and Medicine. 2018. Data Science for Undergraduates: Opportunities and Options. Washington, DC: The National Academies Press. https://doi.org/10.17226/25104.

# Lesson 2: Data acumen in the context of reproducibility

Two key components

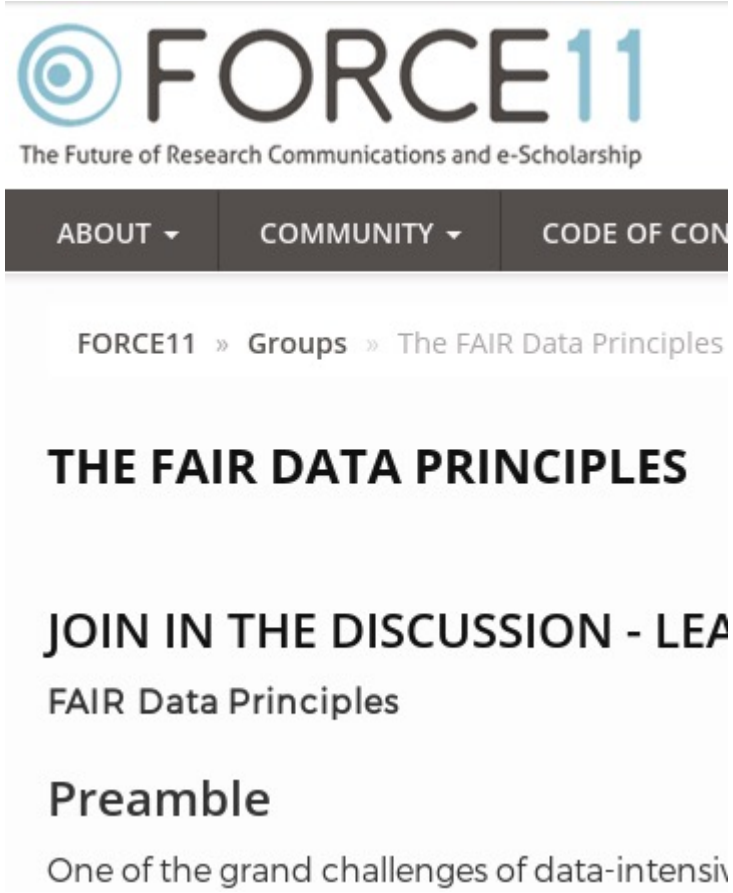
- Data provenance
  - Where did the data come from which I used?
- Data preservation
  - Where do I put the data I generated?
  - What if the data I used are not “robustly preserved”?
  - What do you mean by that?

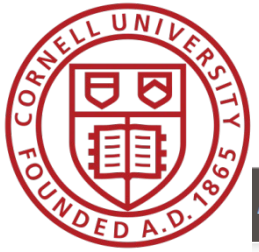
# Data provenance

# Action: Data citations and metadata

What is **FAIR**?

- **F**indable,
- **A**ccessible,
- **I**nteroperable, and
- **R**e-usable





FORCE11

The Future of Research Communications and e-Scholarship

Search

English

ABOUT | COMMUNITY | CODE OF CONDUCT | GROUPS | RESOURCES | NEWS + BLOGS | EVENTS | PUBLIC

perceived criteria of importance.

## 1. Importance

Data should be considered legitimate, citable products of research. Data should be accorded the same importance in the scholarly record as citat research objects, such as publications[1].

## 2. Credit and Attribution

Data citations should facilitate giving scholarly credit and normative and le attribution to all contributors to the data, recognizing that a single style or of attribution may not be applicable to all data[2].

## 3. Evidence

In scholarly literature, whenever and wherever a claim relies upon data, the corresponding data should be cited[3].

## 4. Unique Identification

A data citation should include a persistent method for identification that i actionable, globally unique, and widely used by a community[4].

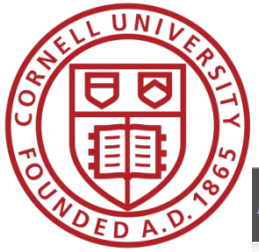
## 5. Access

Data citations should facilitate access to the data themselves and to such

DC1

Data Citation Principles

Data Citation Synthesis Group: Joint Declaration of Data Citation Principles. Martone M. (ed.) San Diego CA: FORCE11; 2014 [https://www.force11.org/group/joint-declaration-data-citation-principles-final].

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1 **Bureau of Labor Statistics.** 2000–2010. "Current Employment Statistics: Colorado, Total Nonfarm, Seasonally adjusted - SMS08000000000000001." United States Department of Labor. http://data.bls.gov/cgi- bin/surveymost?sm+08 (accessed February 9, 2011).

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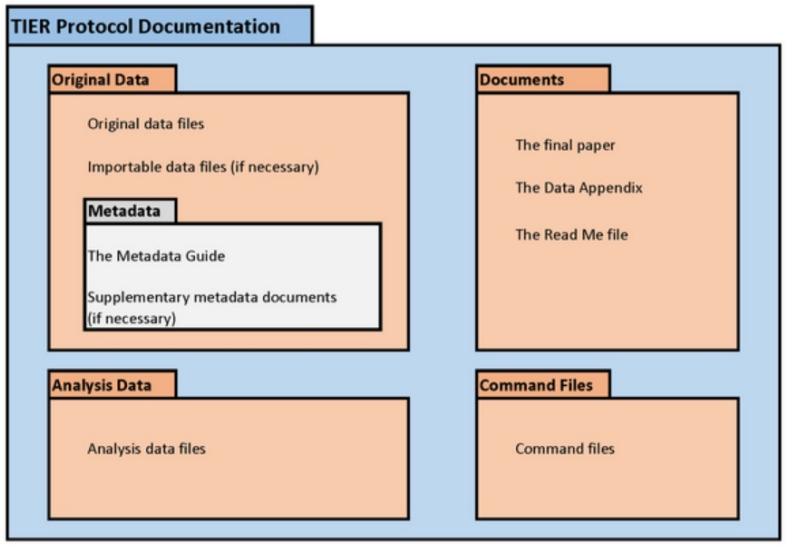
# Observation 3

Social scientists are not trained to cite data

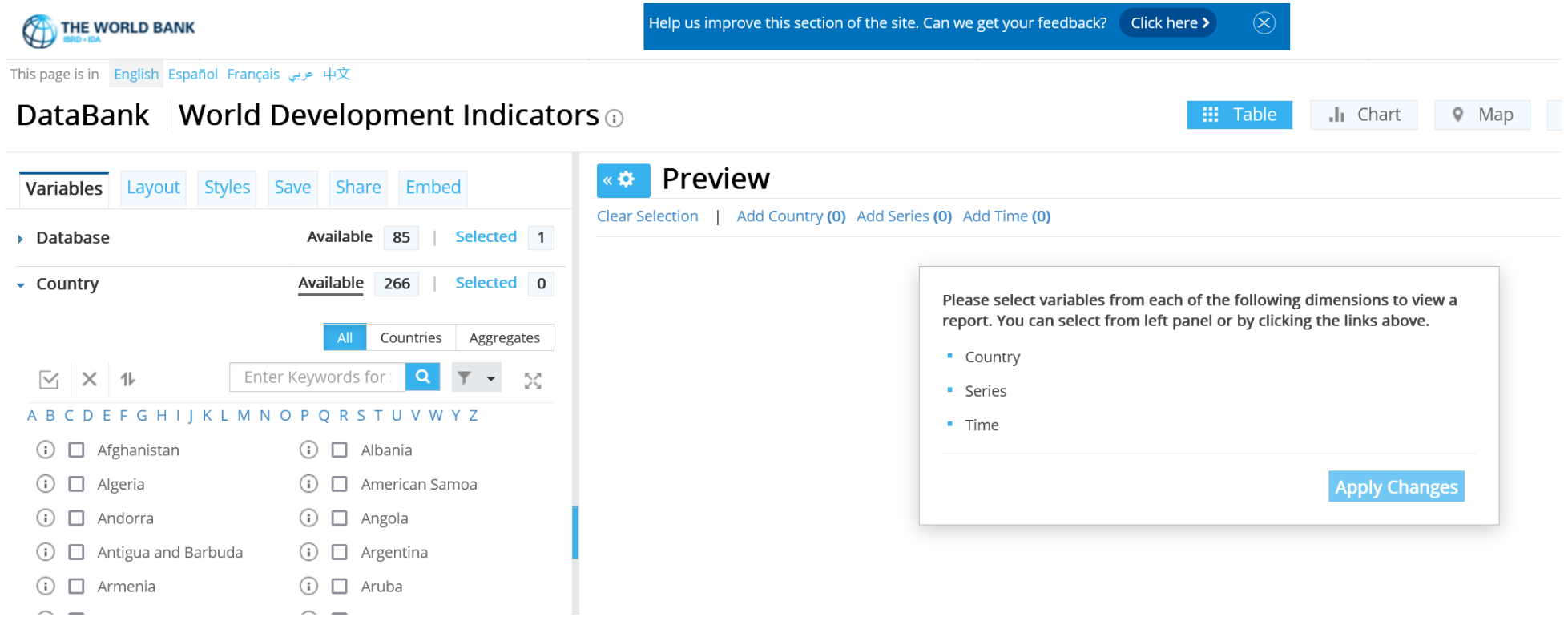
# 2. Keeping track of data: Data provenance

- Keep all information as you collect data
  - See TIER Protocol for good and simple guidance
- If you must use a point-and-click tool, keep detailed instructions
  - Also: obsolescence
- Try to use API, bulk download, or packages that allow for extraction
  - Also: obsolescence of API



# API? But the interface is so cool!

- World Development Indicators



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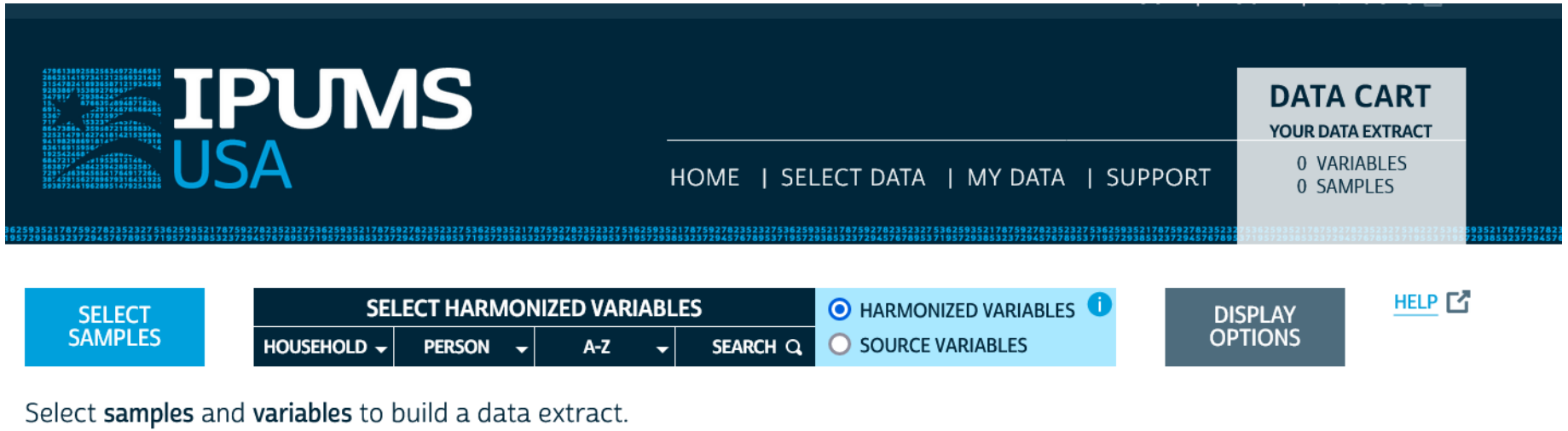
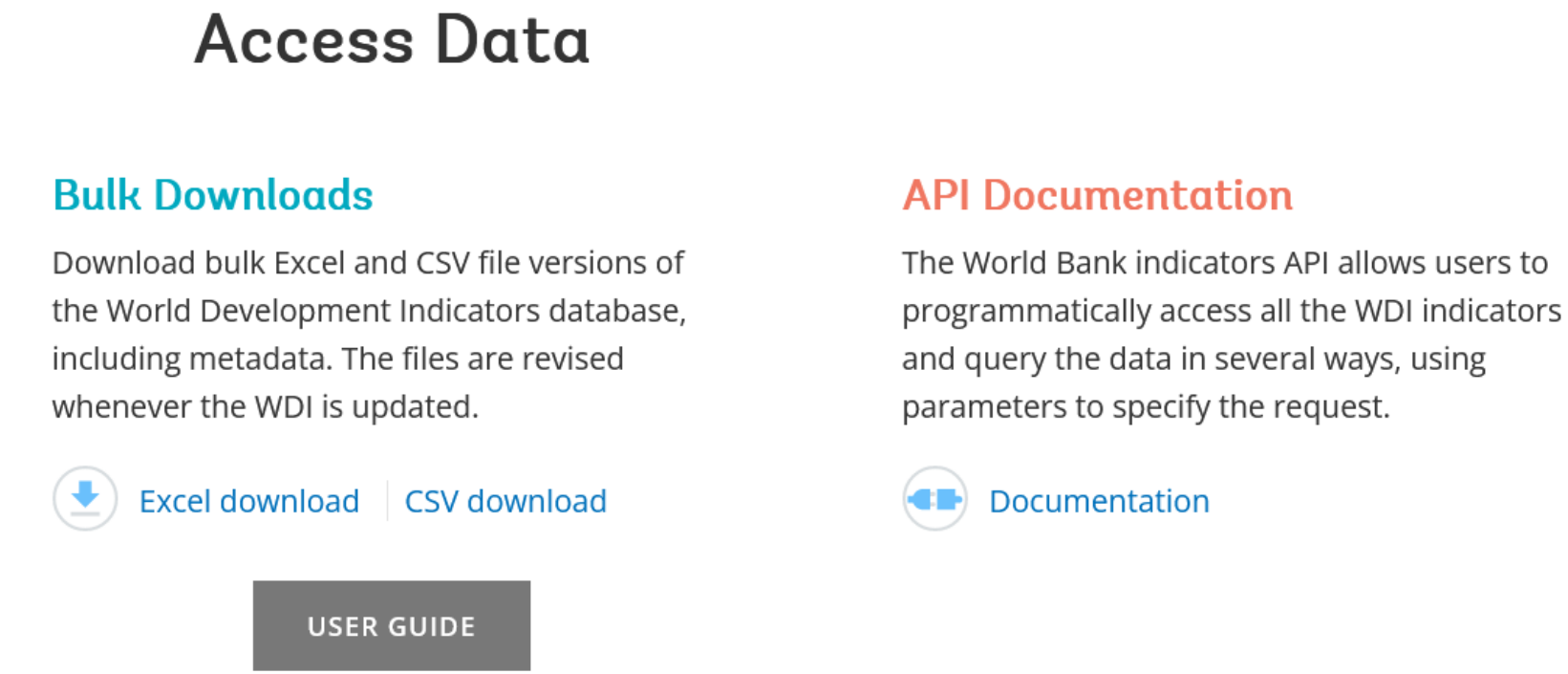
- IPUMS



# API or Bulk Download

- World Development Indicators



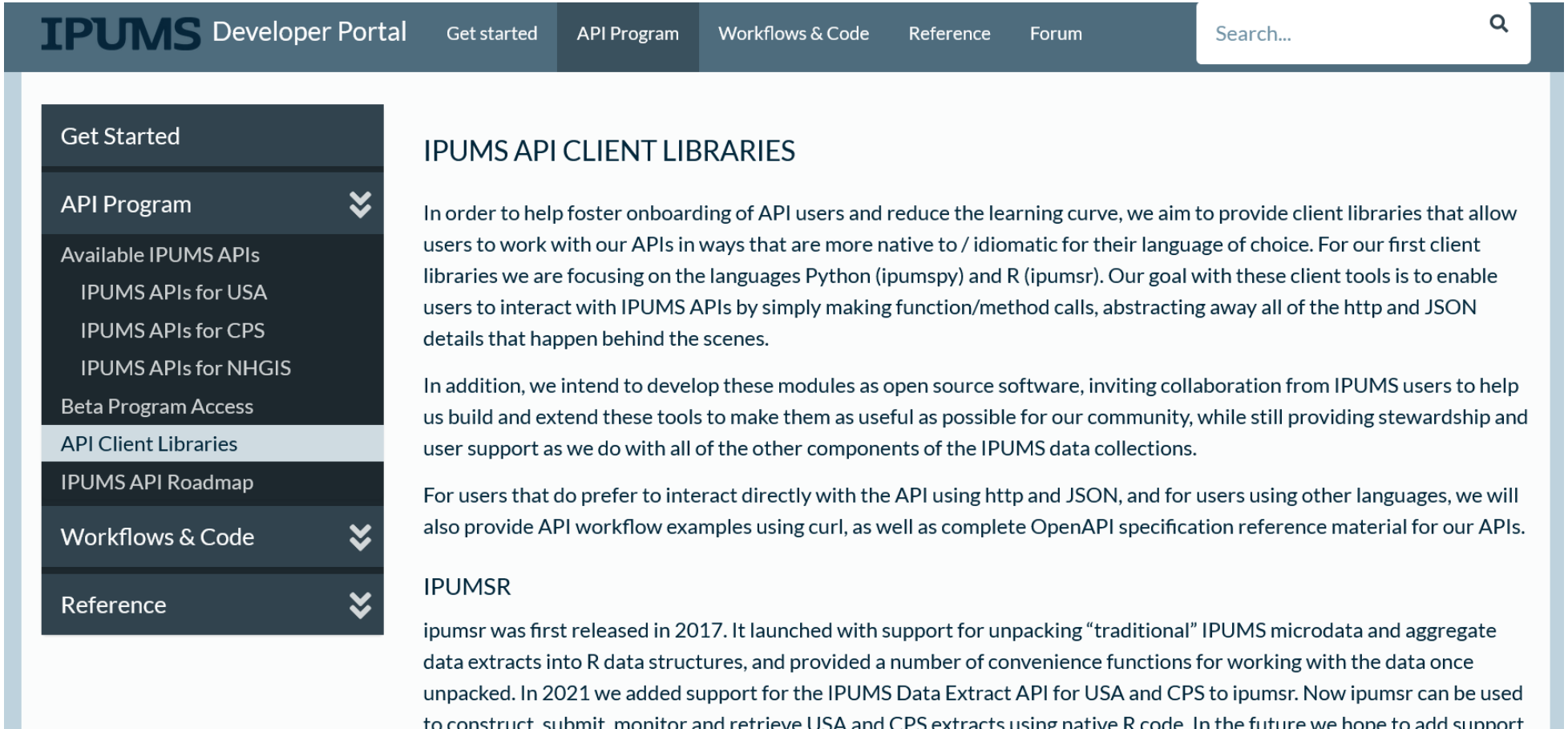
# API or Bulk Download

- World Development Indicators

```
. ssc install wbopendata
. wbopendata, country(ago;bdi;chi;dnk;esp) indicator(sp.pop.0610.fe.un) ///
> year(2000:2010) clear long
```

# API or Bulk Download

- IPUMS (beta)



## 2. Keeping track of data:

# Don’t forget to check the TERMS of USE!

# Observation 4

(Academic)
Social scientists
do not read
the terms of use

Because you may not be able to provide others with a copy of the data (legally)…

# Rights to use data

- You browsed a website
- You purchased the data
- You signed a data use agreement
- You created the data (lab experiment)
- You had survey respondents consent to use (IRB approval!)

# Rights to **distribute** the data

- If you created the data, you decide.
- If you got it from somewhere else:

READ THE TERMS OF USE / DATA USE AGREEMENT / CLICK-THROUGH / ETC.

# Solution 2: Data Provenance

- Keep detailed notes
- script as much as possible
- (also: Use the Social Science Data Editors' template README)

# Coding for Reproducibility


# Lesson 1: Computational empathy

= “Pity the poor replicator”

# Extreme examples

- Matlab-based simulation
- Real example, 10 figures, 4 panels each

- For Figure 5a, comment line 52, uncomment line 151, run the code, then copy the figure into your document.
- For Figure 5b, comment line 151 again, leave line 52 commented, and change the parameter on line 75 to “3”
- ….

# Extreme examples

- Stata-based estimation
- 4 variants

- Run the data creation programs, then copy the data to Folder A
- Copy programs “b.do” and “c.do” from Folder A to Folder B, but modify “c.do” on line 20
- Once done, convert the output from “d.do” to a Matlab file, and run the simulation in Folder B/C
- ….


# Extreme examples

- Matlab-based simulation
- For Figure 5a, comment line 52, uncomment line 151, run the

**Write re-usable code**

**Use primitive I/O to read parameter files**

- ….

# Extreme examples

- Stata-based estimation

- Run the data creation programs, then copy the data to Folder A

Re-use code files (ado)

Use relative or root-relative paths

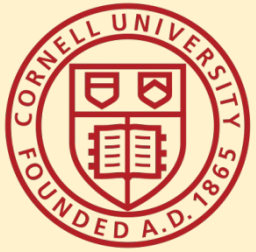
Once done, convert the output from “d.do” to a Matlab file, and run the simulation in Folder B/C

- ….


# Ideal setup

- 1 program to prepare the setup
  - Installs all packages
  - Creates all directories
- 1 program (or a very small number) that creates the rest
  - Possibly with macros/ ado files/ subroutines
  - Possibly with parameter files that might differ per directory
- All tables and figures are output programmatically

- Setting up can be done in all languages
  - Matlab, Stata, R, Python, Fortran
- Subroutines exist in all languages
  - You might need to learn how!
- Ability to output figures and tables (Excel, LaTeX) exist in all languages




# Solution 3: Learn basics of programming

## Code reproducibly

## (and do so right from the start)

(also: way easier to describe in the
Social Science Data Editors' template README)


That’s a lot of stuff to learn and remember…
I want to focus on the economics!

# Keeping track: Students and Researchers

1. Computational empathy
   *Consider the next person to run the analysis, and don't assume too much*
2. Track data
   *even when using API, especially when manually downloading, keep in mind what the next downloader may see/find/receive, terms of use*
3. Learn the basics of programming
   *code reproducibly, use parameter files, re-usable code, robust file structure*
4. Learn to automate
   *Run all code again and again, use APIs to download, use conditional processing to handle various aspects*
5. Preserve it all
   *Use version control, tag releases, preserve data (separately), understand the difference between sharing and preserving*


That's a lot of stuff to learn and remember…

**I want to focus on the economics!**

# Support by Institutions

# Lesson 3: Support by institutions is insufficient

- When should these skills be taught?
  - These are core “tools of the trade”!
  - Undergrad, core part of graduate curricula
  - In other disciplines: students learn how to collect use a pipette, how to tag field mice in the wild…

# Lesson 3: Support by institutions is insufficient

- Should all of these skills be taught?
  - How to deposit data
  - How to set up a compute cluster
- Some of these skills fall into other categories, but
  - Data librarians are understaffed, and not trained in discipline-specific practices
  - Campus IT has highly varying funding and consulting time
  - Cross-campus IT practices are nowhere close to compatible

# Lesson 3: Support by institutions is insufficient

Institutional funding and mandates are not adequate

- Most grant funding in social sciences does not require (or allow!) for this kind of budgeting
  - Earmarked portions of funds would be great!
  - (This is slowly coming, NSF and NIH are making progress)
- (Most) Universities consider this an external mandate, not part of their “overhead”
  - “Provide us with an account, and we will do it”
  - Leads to highly scattershot infrastructure

# Lesson 3: Support by institutions is insufficient

Disciplinary institutions need funding

- Direct funding: should archives be treated like infrastructure?
  - This is the case in many NIH archives
  - Not quite as ubiquitous in social sciences
  - Where do you want to preserve 1TB per user per day for the next 50 years? It's not free…
- Indirect funding (via grants)
  - See previous slide


# Lesson 3: Support by institutions is insufficient

All institutions need to consider the user experience

- Data provenance and preservation would be a lot easier to implement if scripted
  - Need for APIs both for upload and download (usage)
  - Some progress: Zenodo and Dataverse (usually Python, sometimes R)


# Lesson 3: Support by institutions is insufficient

Integration of computational resources with data resources is highly inadequate

- Most journals have “data” policies, but all research compendia have code – this is a problem with many publishers
- Most data repositories are optimized for … data. Support for computational code or actual execution is at best preliminary
  - See CodeOcean, WholeTale, efforts around Dataverse
  - See various “continuous integration” using Github, Travis CI, etc. but difficult to integrate data

# Solution 6: Institutional support

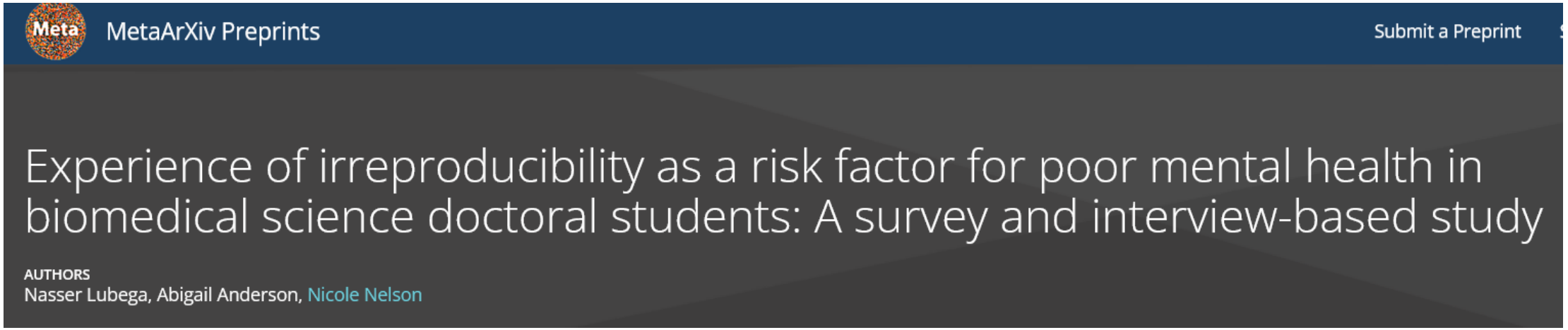
*(departments, schools, libraries, IT, universities)*

1. Offer training in adapted tools
   *(not sufficient to just show how to do a Rmarkdown document)*
2. Highlight appropriate community *(Zenodo, Dataverse, others)* or university sites
3. Provide streamlined access to some frequently used (open/commercial) tools
   *(AWS/GCS/Azure, CI on Github/others, etc.)*

# Some thoughts for the role of Faculty

1. Encourage students to learn new skills outside of economics
   *Even or especially if you do not have the time to do so*
2. Demand reproducibility when reviewing (*articles, theses, intermediate reports from students, etc.*)
   *automated re-runs on Github, which particular release to review, refusing emailed copies*
3. Incentivize reproducibility
   *For robustness, for efficiency, but also training for exposure to the discipline.*
   *Example: Replication Challenges*

# Please don’t produce irreproducible articles!



# The role for journals

# Goal: Transportability

Any standards, tools, methods: must be transportable across journals (no custom solutions)

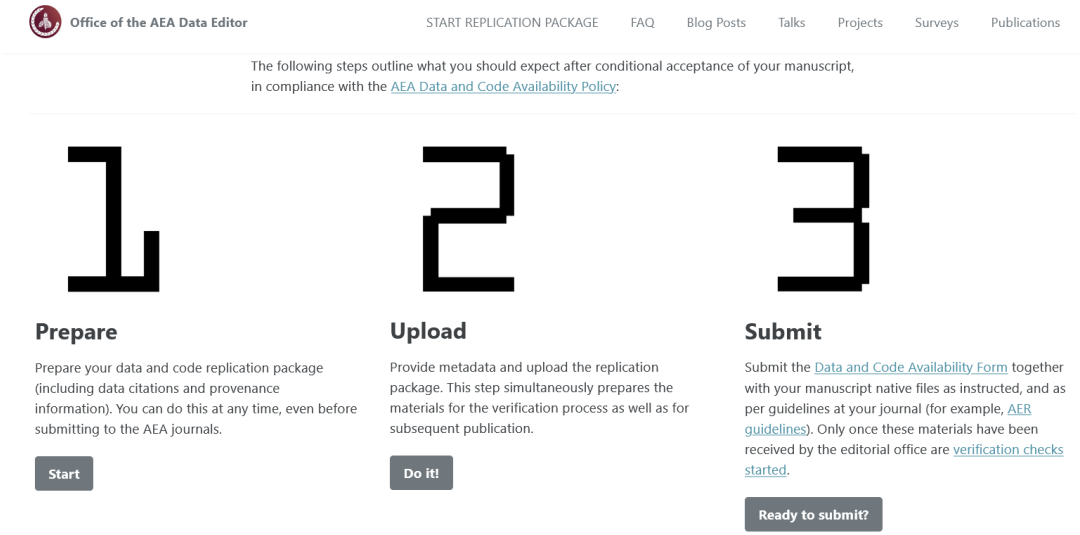
# Social science “guild”

Social Science Data Editors

https://social-science-data-editors.github.io/guidance/

# Some resources

- https://social-science-data-editors.github.io/guidance/
  - **template README**
  - discussion of licensing
  - data citation guidance
- https://aeadataeditor.github.io/



# Thank you!

# Reminder: **Students and Researchers**

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5. Preserve it all
   *Use version control, tag releases, preserve data (separately), understand the difference between sharing and preserving*


# Example of data provenance

# “It’s a file called stockmarket.xlsx”

2101.49
2057.64
2063.11
2077.42
2076.78
0
2068.76
2081.34
2046.68
2051.31
2076.62
2099.60
2108.95
2107.40
2124.29
2126.64
2128.28
2119.21
2114.15
2102.15
2079.65
2067.64
2093.25
2108.57
2108.63
2103.84

# “It’s a file called SP500.xlsx”

| | |
|---|---|
| SP500 | S&P 500, Index, Daily, Not Seasonally Adjusted |

Frequency: Daily, Close

| observation_date | SP500 |
|---|---|
| 2015-06-26 | 2101.49 |
| 2015-06-29 | 2057.64 |
| 2015-06-30 | 2063.11 |
| 2015-07-01 | 2077.42 |
| 2015-07-02 | 2076.78 |
| 2015-07-03 | 0 |
| 2015-07-06 | 2068.76 |
| 2015-07-07 | 2081.34 |
| 2015-07-08 | 2046.68 |
| 2015-07-09 | 2051.31 |
| 2015-07-10 | 2076.62 |
| 2015-07-13 | 2099.60 |
| 2015-07-14 | 2108.95 |
| 2015-07-15 | 2107.40 |
| 2015-07-16 | 2124.29 |
| 2015-07-17 | 2126.64 |
| 2015-07-20 | 2128.28 |

# “It’s a file called SP500.xlsx, downloaded from FRED.”

| | |
|---|---|
| SP500 | S&P 500, Index, Daily, Not Seasonally Adjusted |

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| observation_date | SP500 |
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| | 2015-07-08 | 2046.68 |
| | 2015-07-09 | 2051.31 |
| | 2015-07-10 | 2076.62 |
| | 2015-07-13 | 2099.60 |
| | 2015-07-14 | 2108.95 |
| | 2015-07-15 | 2107.40 |
| | 2015-07-16 | 2124.29 |
| | 2015-07-17 | 2126.64 |
| | 2015-07-20 | 2128.28 |

S&P Dow Jones Indices LLC. 2020. “*S&P 500 [SP500] [dataset]*”, retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, June 26, 2020.

# “SP500.xlsx, from S&P (2020). Not provided as part of replication package because © S&P. ”

| | |
|---|---|
| SP500 | S&P 500, Index, Daily, Not Seasonally Adjusted |

Frequency: Daily, Close

| observation_date | SP500 |
|---|---|
| 2015-06-26 | 2101.49 |
| 2015-06-29 | 2057.64 |
| 2015-06-30 | 2063.11 |
| 2015-07-01 | 2077.42 |
| 2015-07-02 | 2076.78 |
| 2015-07-03 | 0 |
| 2015-07-06 | 2068.76 |
| 2015-07-07 | 2081.34 |
| 2015-07-08 | 2046.68 |
| 2015-07-09 | 2051.31 |
| 2015-07-10 | 2076.62 |
| 2015-07-13 | 2099.60 |
| 2015-07-14 | 2108.95 |
| 2015-07-15 | 2107.40 |
| 2015-07-16 | 2124.29 |
| 2015-07-17 | 2126.64 |
| 2015-07-20 | 2128.28 |

S&P Dow Jones Indices LLC. 2020. “*S&P 500 [SP500] [dataset]*”, retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, June 26, 2020.

# Data Availability Statements

"SP500.xlsx, from S&P (2020). Not provided as part of replication package because © S&P. "

Describes data file, where to get it, how to get it, and any conditions of obtaining it

S&P 500, Index, Daily,
Not Seasonally Adjusted

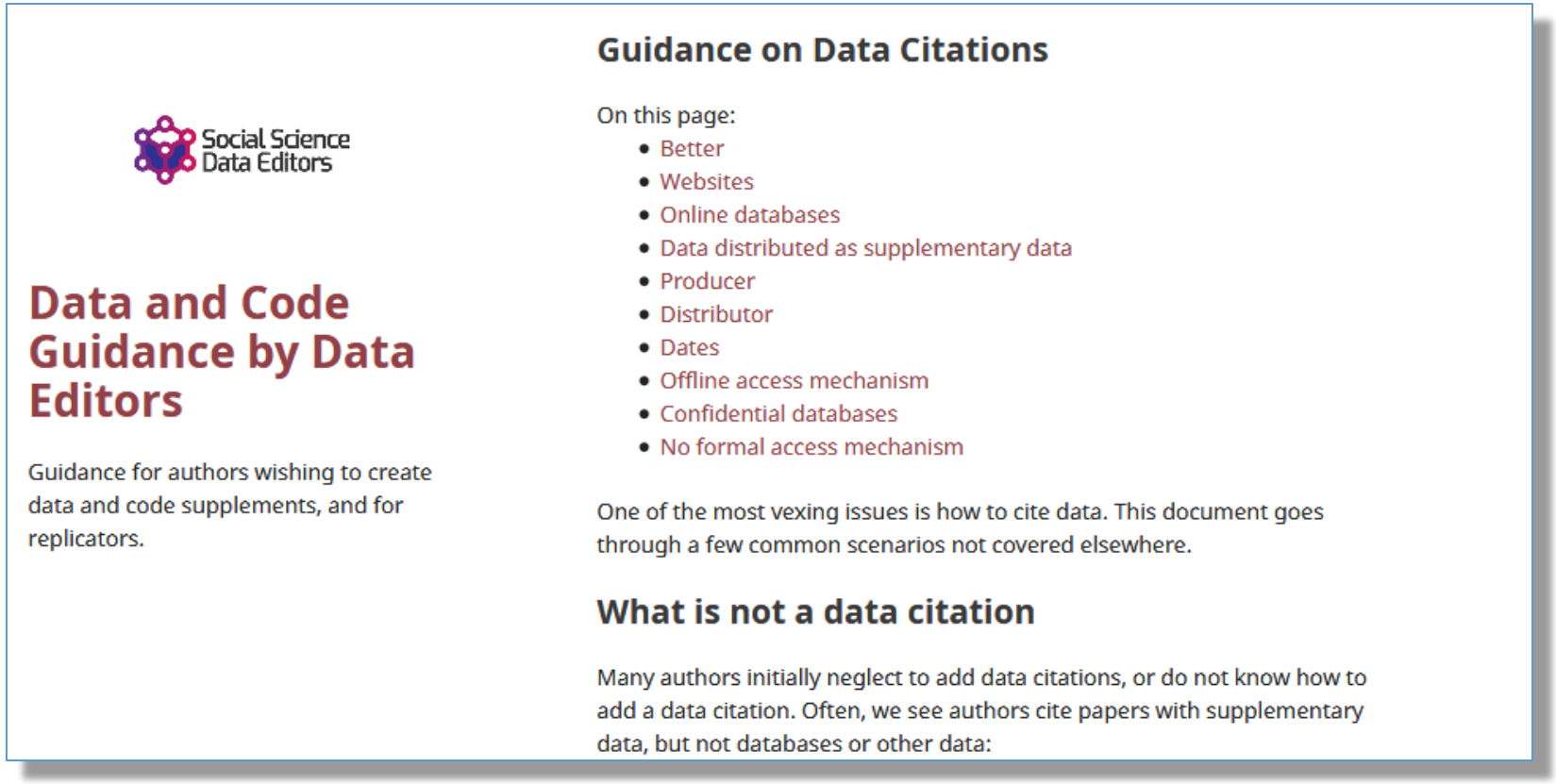
| | |
|---|---|
| 2015-07-15 | 2107.40 |
| 2015-07-16 | 2124.29 |
| 2015-07-17 | 2126.64 |
| 2015-07-20 | 2128.28 |

S&P Dow Jones Indices LLC. 2020. "*S&P 500 [SP500] [dataset]*", retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, June 26, 2020.


# Data Citations

# Data citations

- Creating specific guidance in the absence of strong discipline-specific guidance




https://social-science-data-editors.github.io/guidance/addtl-data-citation-guidance.html

# Example 4: German Restricted-access

IAB FDZ
RESEARCH DATA CENTRE (FDZ)
of the German Federal Employment Agency (BA)
at the Institute for Employment Research (IAB)

Home | Newsletter | Jobs | Contact | Data Privacy | Imprint

| Data Version | DOI (Link to Description of Data Version) | Availability (yyyy-mm-dd) |
|---|---|---|
| **BHP 7518 v1 (current)** | 10.5164/IAB.BHP7518.de.en.v1 | 2020-01-13 |
| **BHP 7517 v1** | 10.5164/IAB.BHP7517.de.en.v1 | 2018-12-12 |
| **BHP 7516 v1** | 10.5164/IAB.BHP7516.de.en.v1 | 2018-04-11 |

External data
Data Archive
Data Access
Campus Files
Publications
Events
Projects of FDZ users
FDZ Projects
Complaint point of the RatSWD
Figures of the FDZ

employees, both in total and broken down by gender, age, occupational status, qualification and nationality. Means and medians of wages for full-time employees are given, too. Additional datasets providing information about (gross) worker flows and about foundations and closures of establishments are available on request.

### Data Versions

Old versions are only available for replication studies and only in justified exceptional cases for new Projects.

| Data Version | DOI (Link to Description of Data Version) | Availability (yyyy-mm-dd) |
|---|---|---|
| **BHP 7518 v1 (current)** | 10.5164/IAB.BHP7518.de.en.v1 | 2020-01-13 |

# Data Citation

"SP500.xlsx, from S&P (2020). Not provided as part of replication package because © S&P. "

| SP500 | S&P 500, Index, Daily, Not Seasonally Adjusted |
|---|---|
| | 2101.49 |
| | 2057.64 |
| | 2063.11 |
| | 2076.78 |
| | 0 |
| | 2068.76 |
| | 2081.34 |
| 2015-07-08 | 2046.68 |
| 2015-07-09 | 2051.31 |
| 2015-07-10 | 2076.62 |
| 2015-07-13 | 2099.60 |
| 2015-07-14 | 2108.95 |
| 2015-07-15 | 2107.40 |
| 2015-07-16 | 2124.29 |
| 2015-07-17 | 2126.64 |
| 2015-07-20 | 2128.28 |

S&P Dow Jones Indices LLC. 2020. "*S&P 500 [SP500] [dataset]*", retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, June 26, 2020.


Attributes the file to the proper source

# Element of a (data) citation

ICPSR notes that a citation should include the following items:

- Author
- Title
- Distributor
- Date
- Version
- Persistent identifier

**Suggested Citation:**

S&P Dow Jones Indices LLC, *S&P 500 [SP500]*, retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/SP500, June 26, 2020.

# Element of a (data) citation

ICPSR notes that a citation should include the following items:

- Author
- Title
- Distributor
- Date
- Version
- Persistent identifier

**Constructed Citation:**

Institute for Employment Research (IAB), Establishment History Panel 1975-2018. Accessed via the Research Data Centre (FDZ) of the German Federal Employment Agency DOI: 10.5164/IAB.BHP7518.de.en.v1 June 26, 2020.

# Element of a (data) citation

ICPSR notes that a citation should include the following items:

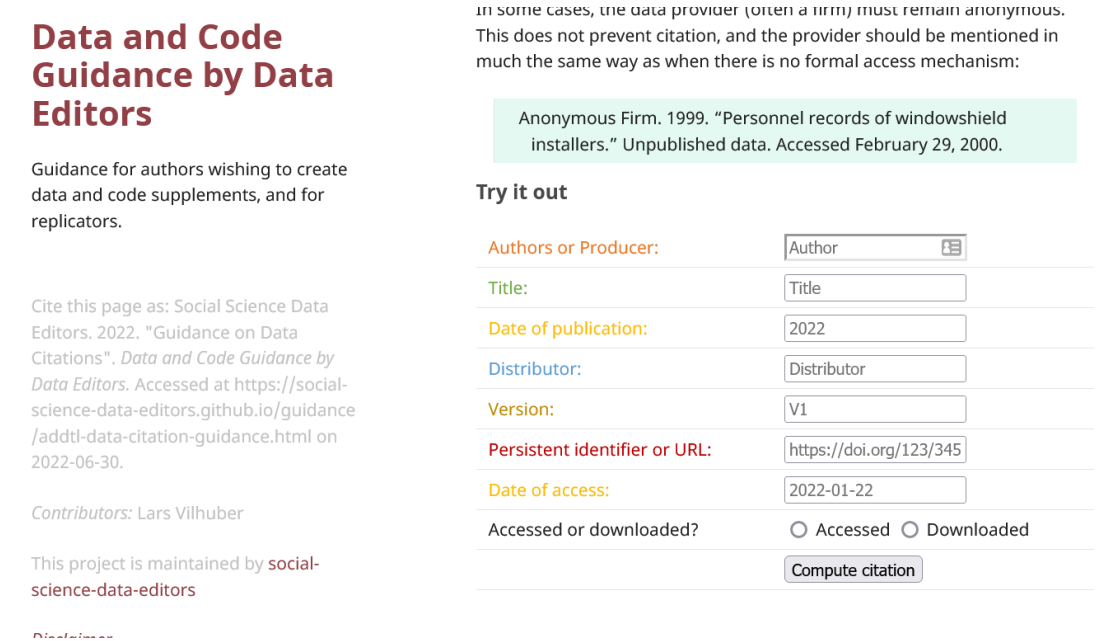
- Author
- Title
- Distributor
- Date
- Version
- Persistent identifier

**Constructed Citation:**

US Census Bureau, Longitudinal Business Database (LBD) 1975-2018. Last accessed via the Federal Statistical Research Data Centre (FSRDC) June 26, 2020.

# Try it out yourself

- Construct an (approximate) data citation
- https://social-science-data-editors.github.io/guidance/addtl-data-citation-guidance.html#try-it-out



## Data and Code Guidance by Data Editors

Guidance for authors wishing to create data and code supplements, and for replicators.

Cite this page as: Social Science Data Editors. 2022. "Guidance on Data Citations". *Data and Code Guidance by Data Editors*. Accessed at https://social-science-data-editors.github.io/guidance/addtl-data-citation-guidance.html on 2022-06-30.

*Contributors:* Lars Vilhuber

This project is maintained by social-science-data-editors

In some cases, the data provider (often a firm) must remain anonymous. This does not prevent citation, and the provider should be mentioned in much the same way as when there is no formal access mechanism:

> Anonymous Firm. 1999. "Personnel records of windowshield installers." Unpublished data. Accessed February 29, 2000.

**Try it out**

| | |
|---|---|
| Authors or Producer: | Author |
| Title: | Title |
| Date of publication: | 2022 |
| Distributor: | Distributor |
| Version: | V1 |
| Persistent identifier or URL: | https://doi.org/123/345 |
| Date of access: | 2022-01-22 |
| Accessed or downloaded? | ○ Accessed ○ Downloaded |
| | Compute citation |

# Data: Citations, Access, Rights

- Any data can be cited – even if you can't download it
- Any data that you accessed … can have that access be described
  - But caution: It should be such that others can also repeat the access!
- Just because you "have" the data does not mean you can give it to others
  - Also: distinguish between "sharing" and "publishing"
  - Know your terms of use!

Data Availability Statements (DAS)

- A statement about **where data** supporting the results reported in a published article can be

o publicly
ated during

y providing a

l restrictions,

Data Availa

- A stateme
  **available**
  - DOI assi
  - But long
- A statement about **usage rights**
  - Not every dataset is in the public domain
  - Not everybody knows that U.S. Government data are usually in the public domain

**Provide data citations (in manuscript) and data availability statements (in README or appendix)**

# Solution 3: Data Citations

Cite every data source

(not only the paper that describes the source!)

(also: add them to the
Social Science Data Editors' template README)