University of Saskatchewan

# Open Science in Practice

NUTR 230 | FYRE

# What do you associate with the word OPEN?

# What do you associate with the word CLOSED?

# Open

https://tinyurl.com/yxu8nw38

# Closed

https://tinyurl.com/y2eq2ngl

# Learning Objectives

Articulate the difference between closed and open science approaches

Define open science

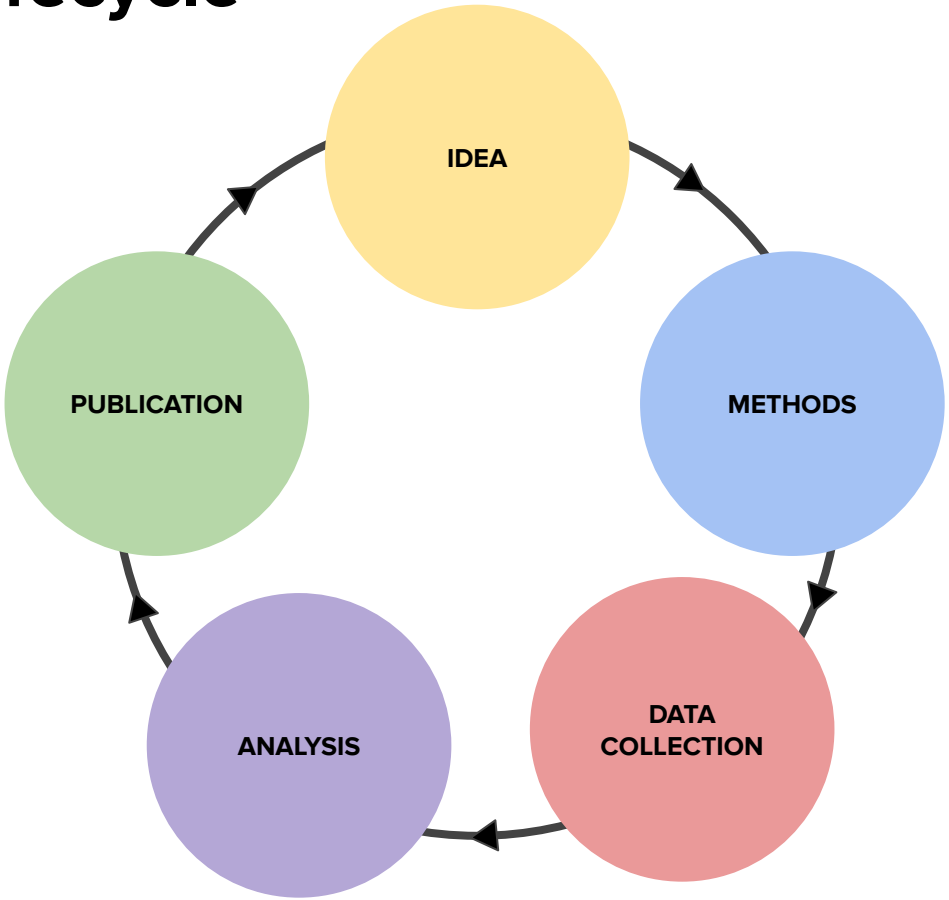
Outline the different stages of the research lifecycle

Identify current open science initiatives

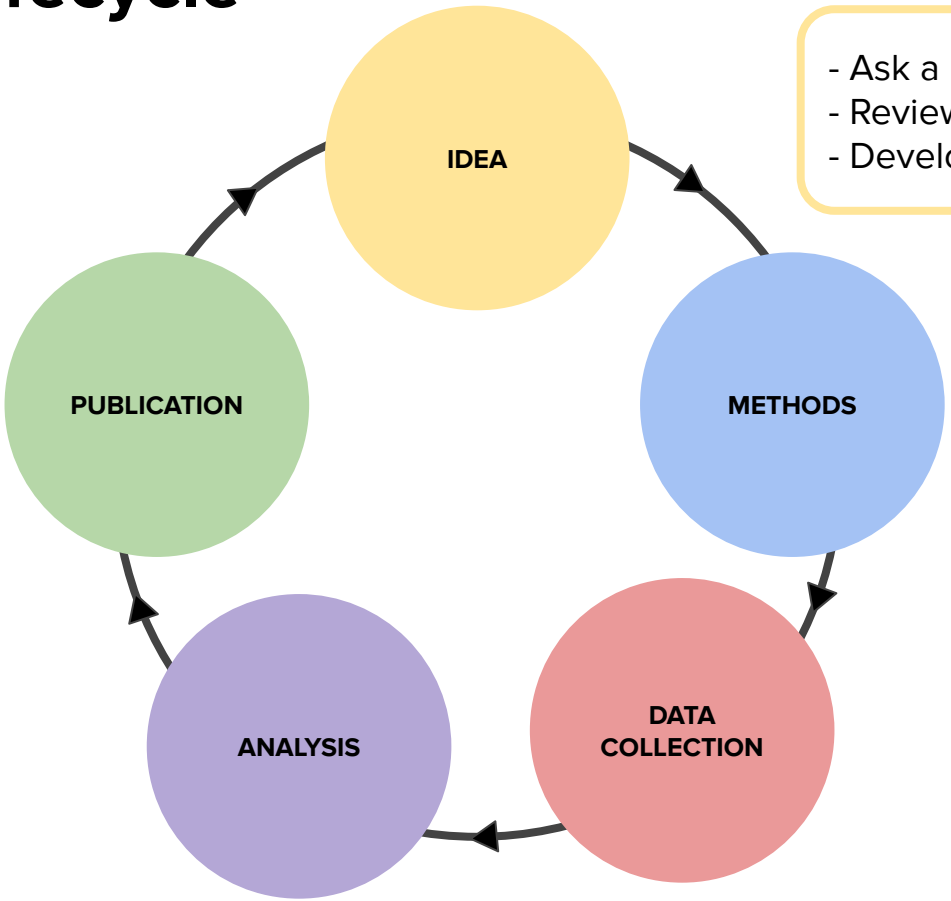
Apply best practices in open science

# FYRE Lifecycle

# Research Lifecycle

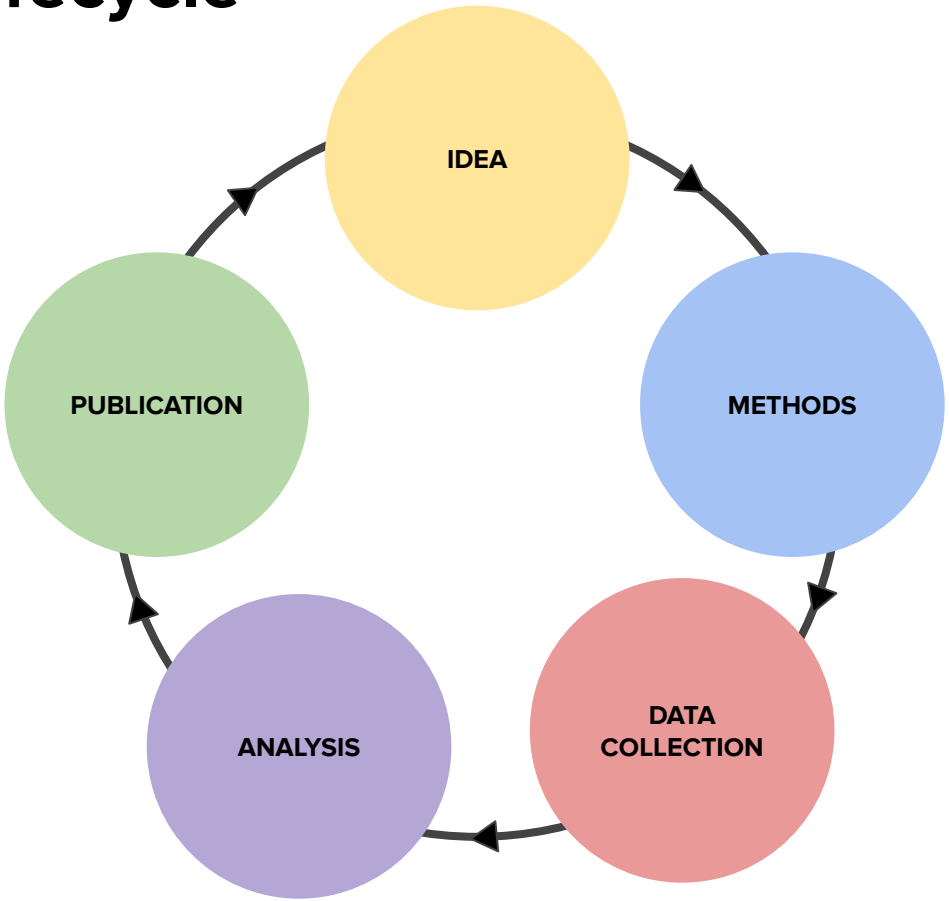


# Research Lifecycle



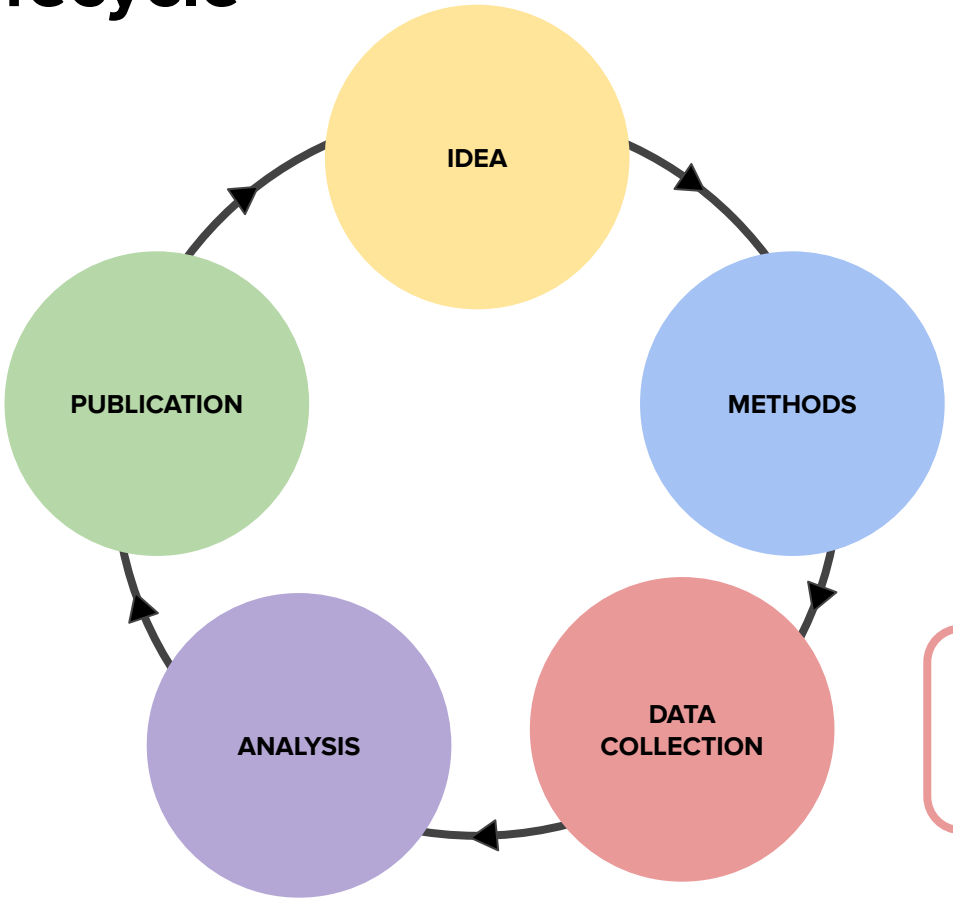

- Ask a research question
- Review existing research
- Develop hypothesis

# Research Lifecycle



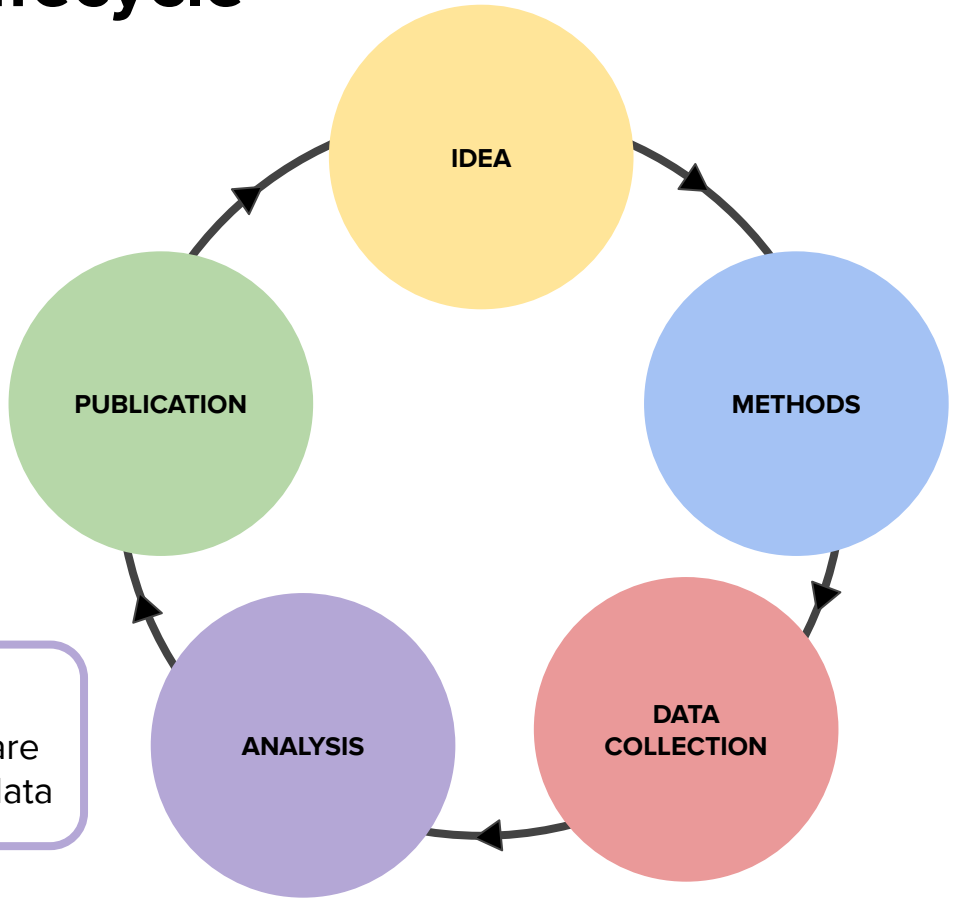

- Develop instruments
- Plan experiments
- Identify participants and/or subject(s)

# Research Lifecycle




- Gather text, numbers, images, etc.
- Store data
- Describe data

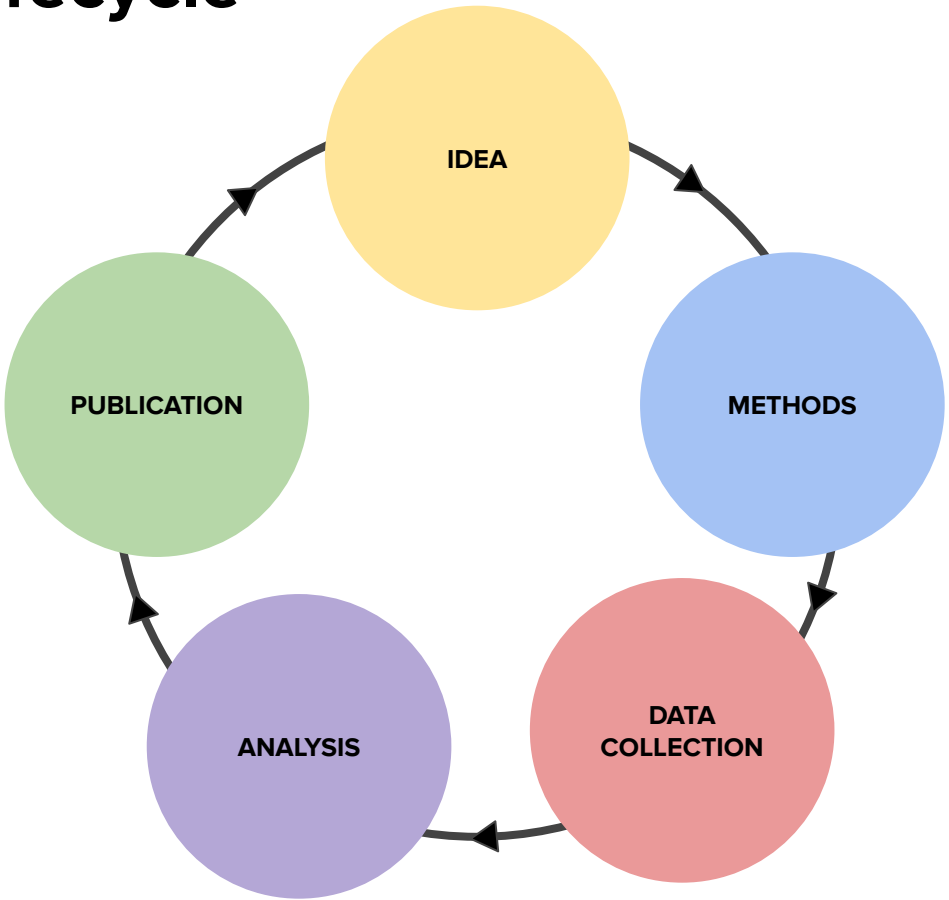
# Research Lifecycle




- Build analysis plan
- Use statistics software
- Analyze/transform data

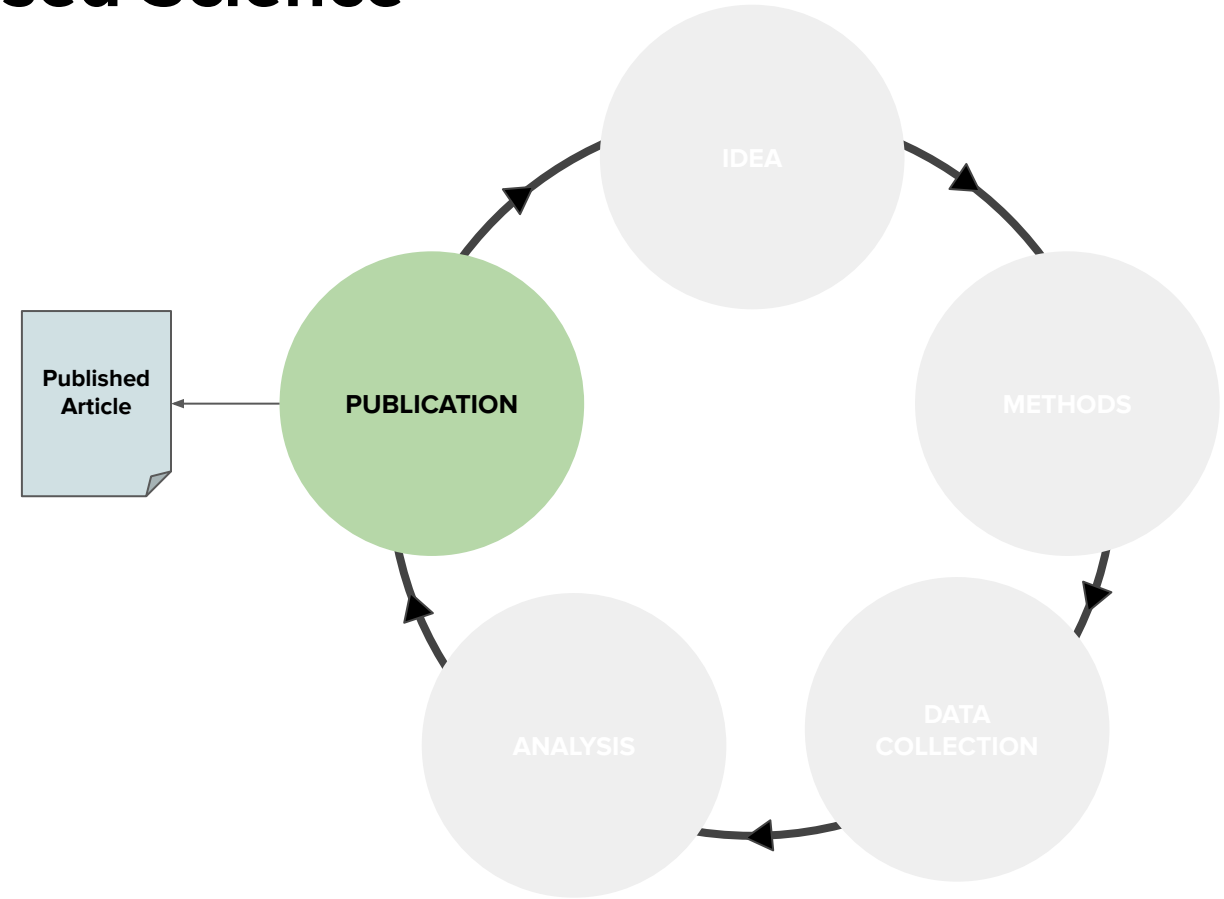
# Research Lifecycle

- Present at conference
- Publish in journal
- Share research data

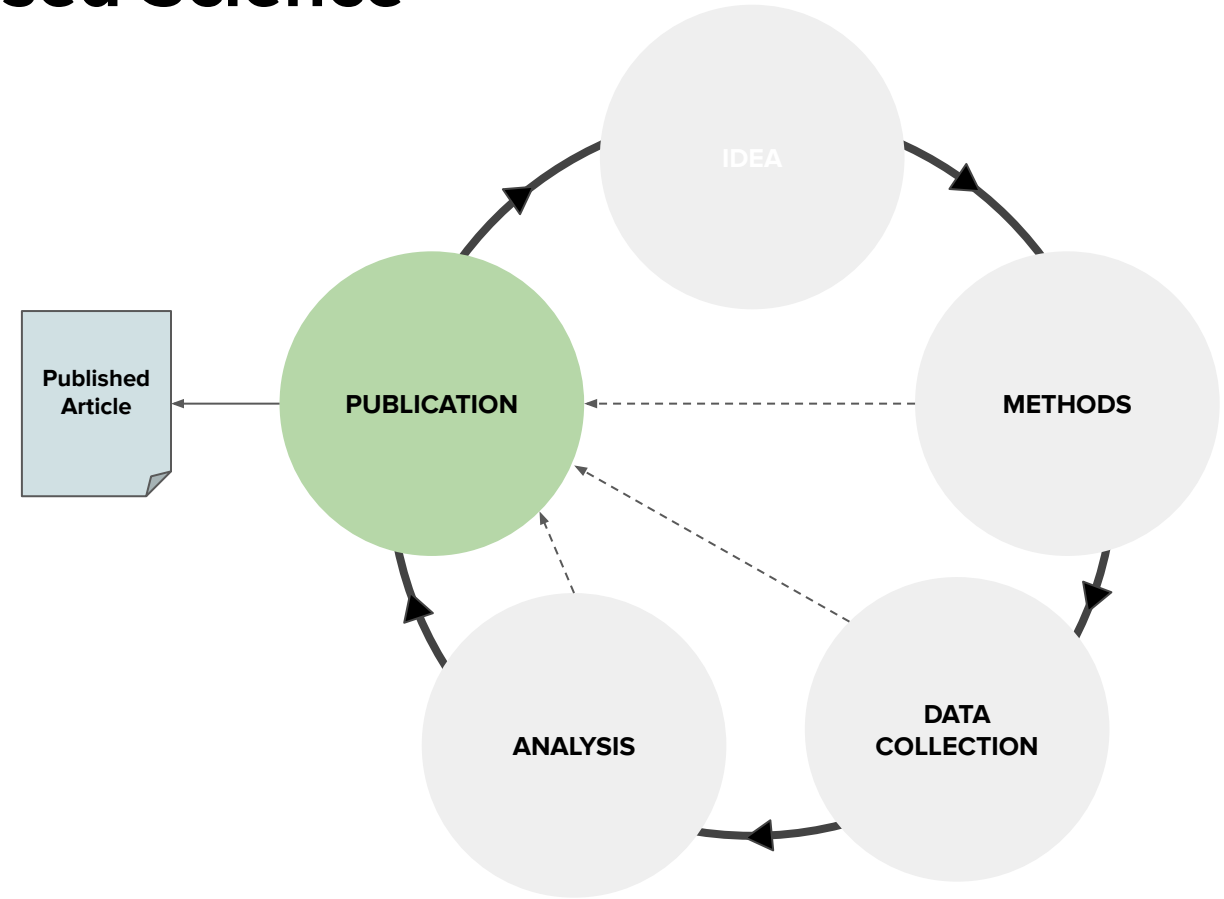


# Scientific Research Today

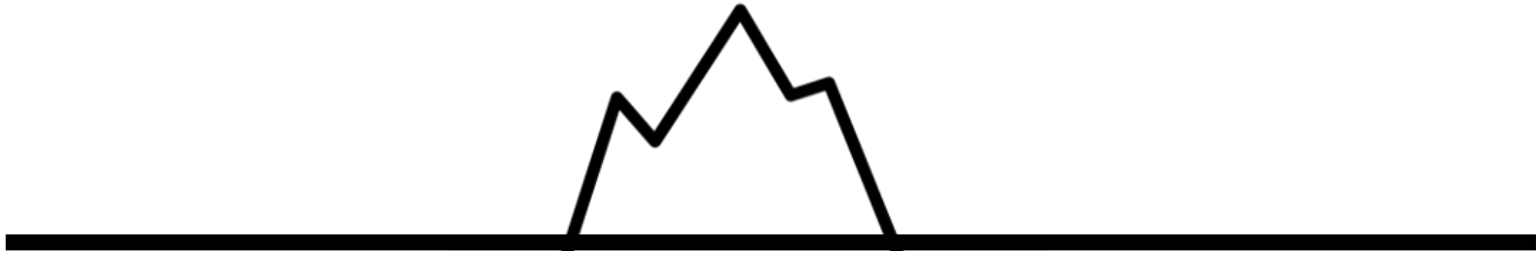
# Closed Science



# Closed Science



# Publication / Poster / Presentation



# Why is Closed Science Problematic?

Hides key components of the research process

Makes reproducing or reusing research results difficult

Restricts access to research

Eliminates trust in research

Creates competitive atmosphere where researchers are pitted against one another

# Reproducibility Crisis

**What is reproducibility?**
The ability to follow or implement the same experiments using the same data/tools to get the same results

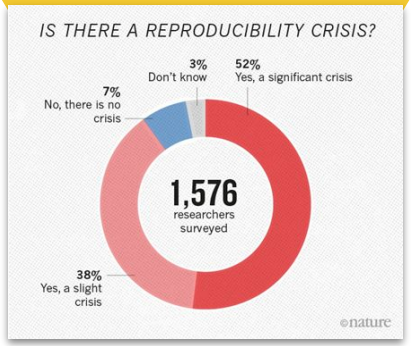
Recent studies have found that research results ***could not*** be recreated

**Common issues:**

- Lack of transparency
- Poor documentation

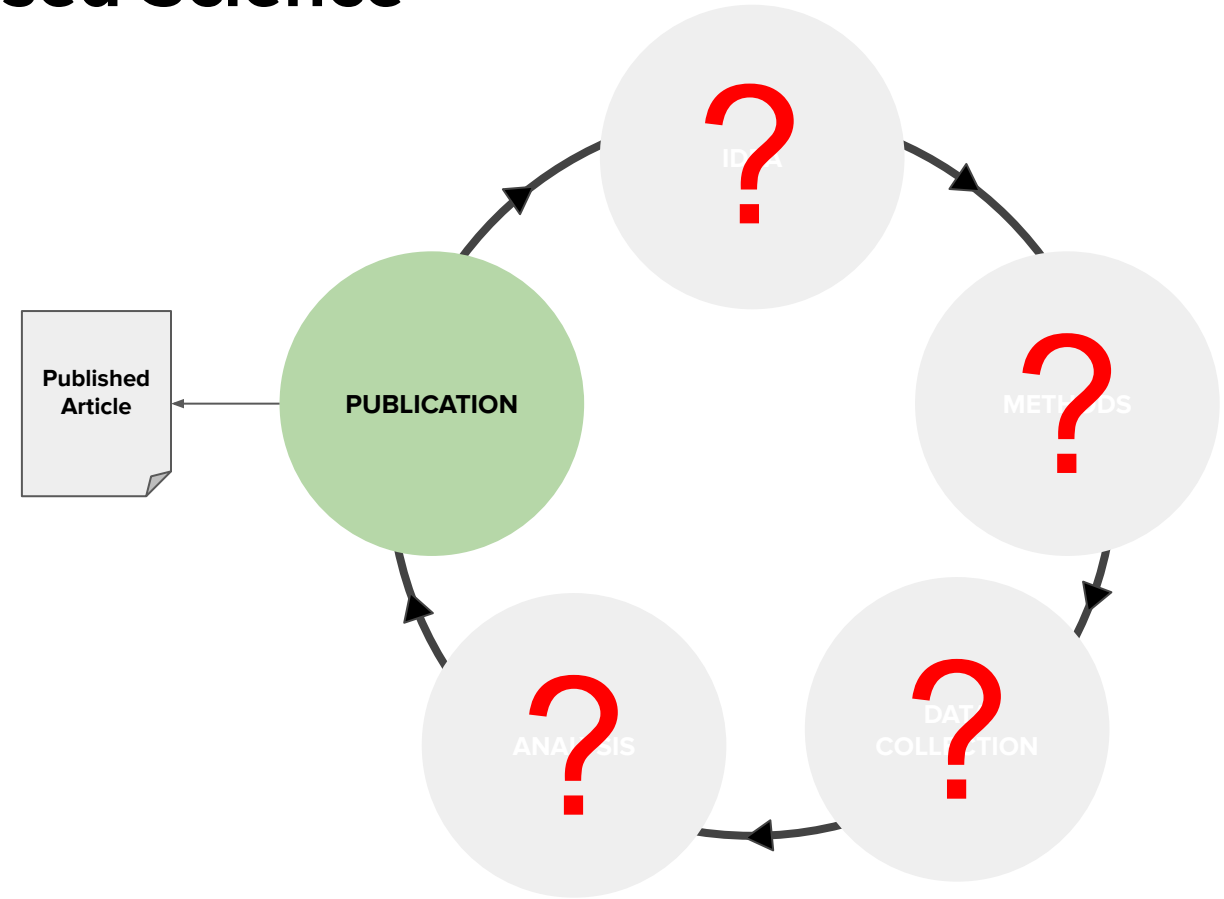
http://www.nature.com/news/over-half-of-psychology-studies-fail-reproducibility-test-1.18248






http://www.nature.com/news/1-500-scientists-lift-the-lid-on-reproducibility-1.19970

# Closed Science



# An Example

## HEAVENLY PIE

2 ripe bananas
⅛ t. salt
½ t. vanilla
¼ c. chopped nuts
1 c. granulated sugar
2 egg whites
½ pint whipped cream

Put in shell, put cream and chopped nuts on top.

MRS. R. D. SICKAFOOSE, Magnolia Grange, Stark County

http://1.bp.blogspot.com/-vHN5EzfAmBA/Vbesj-Aq12I/AAAAAAAACq8/C1bQmrJaKq4/s1600/heavenly%2Bpie.png

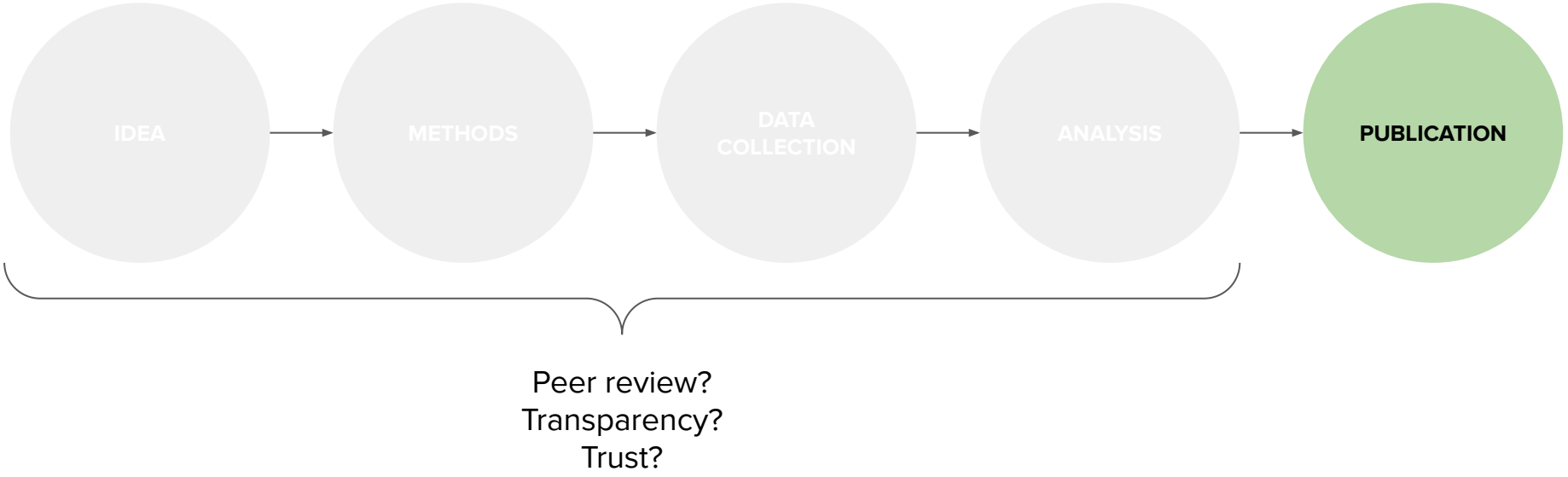
# The Research Process

Heavenly Pie

=

Published journal article

# Closed Science: Hidden process

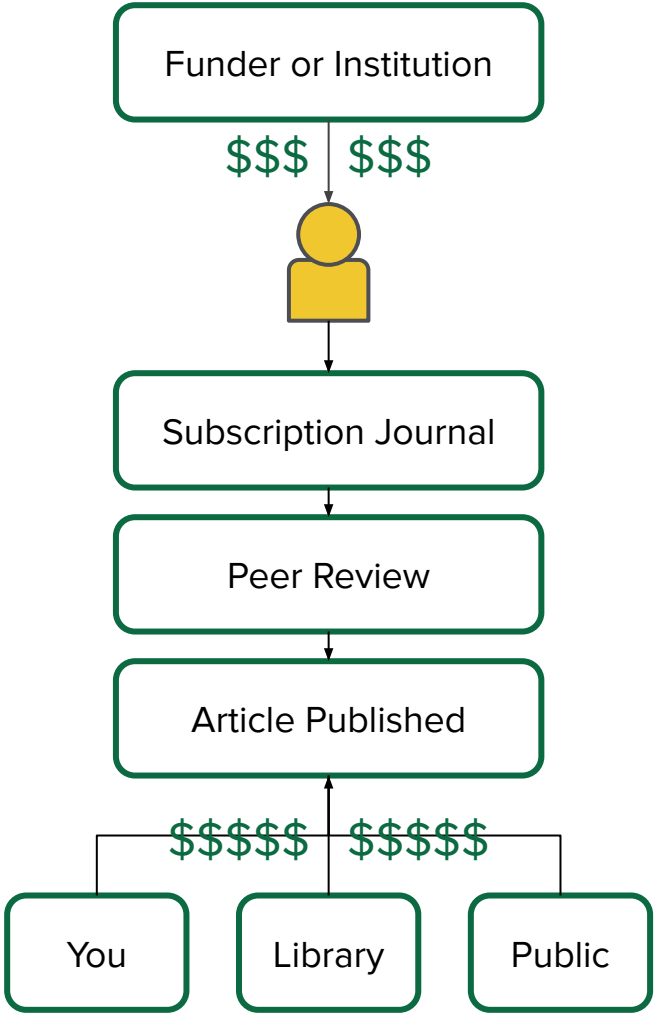


# Publishing articles: *Subscription Model*

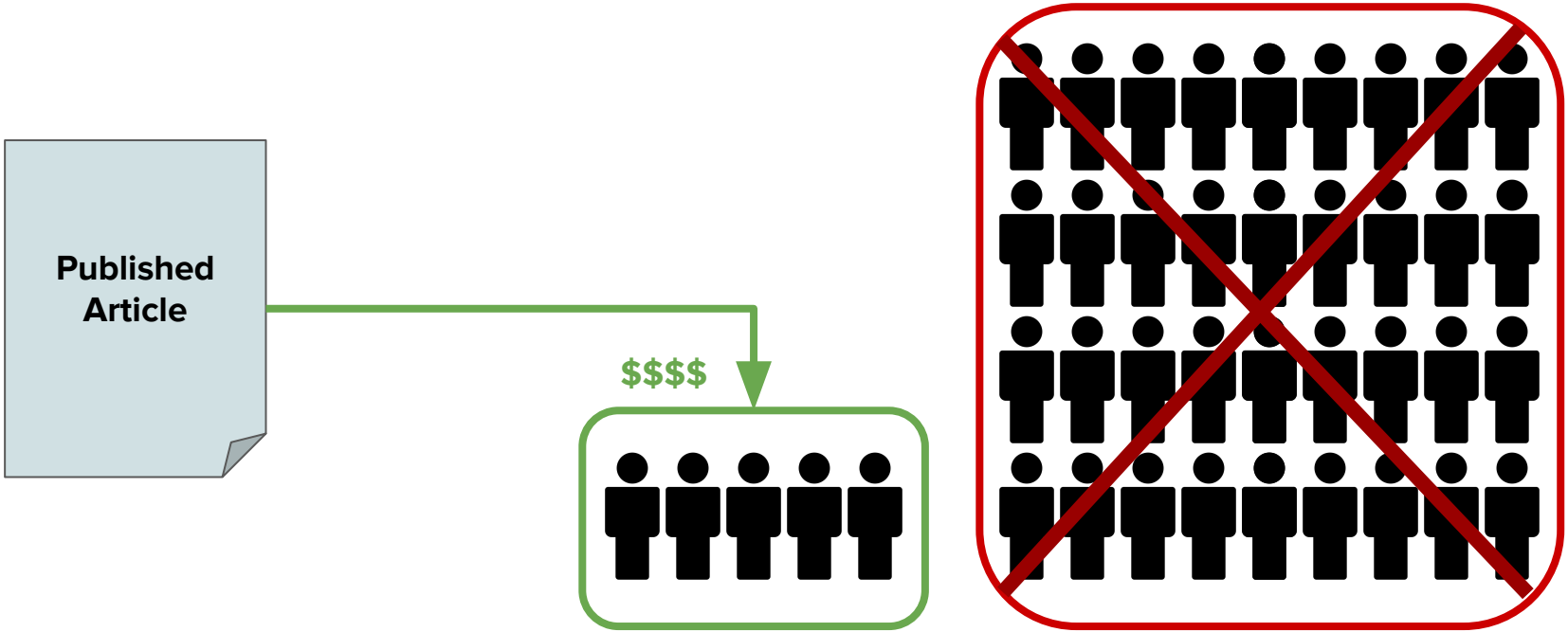
Forces the public to pay for research that may have been publicly funded

Increasing expense of these journals make them difficult to access

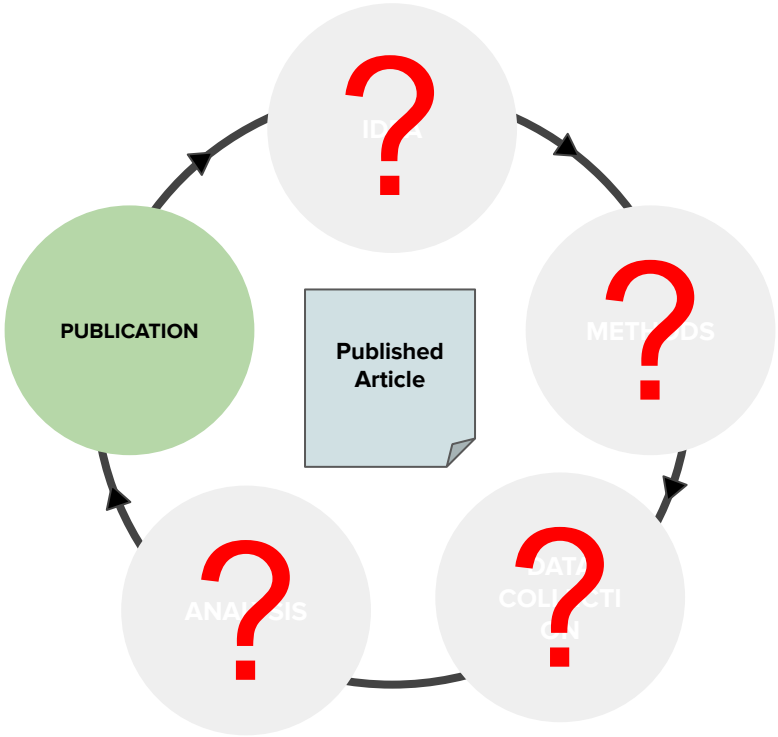
Limits access to those who can afford to pay

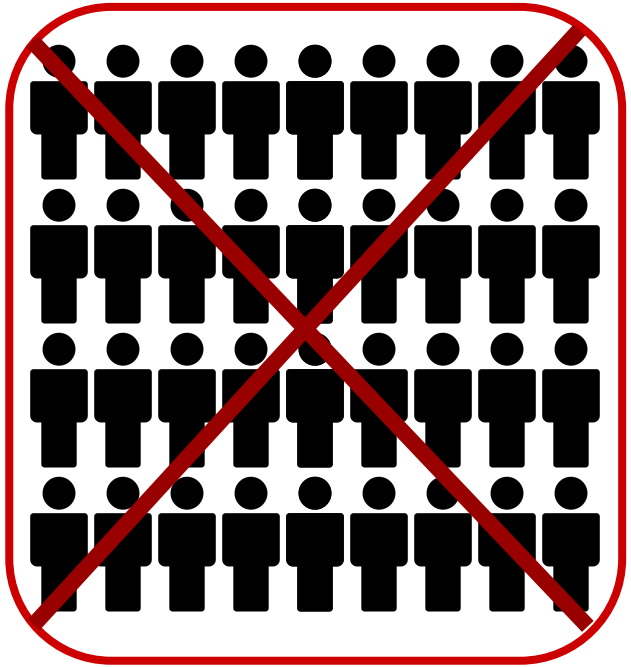


# Closed Science: Subscription Model



# Closed Science



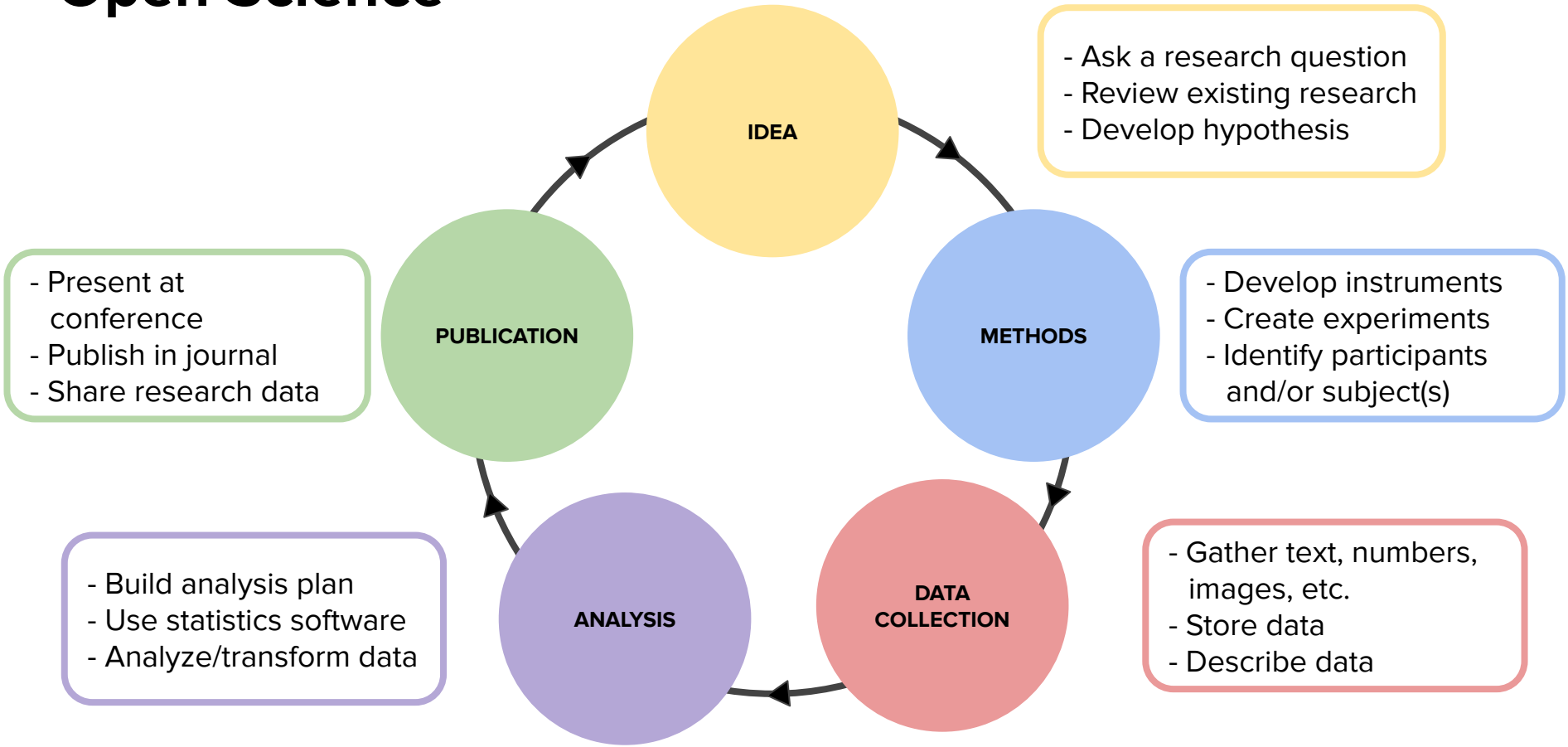
# Transitioning to Open Science

# What is Open Science?

**Goals:**

1. To make the products (e.g., publication, data, methods) of publicly funded research results publicly accessible with no or minimal restriction (OECD, 2015)
2. Foster sharing and collaboration as early as possible in the research process
3. Creating a systemic change to the way science and research is done

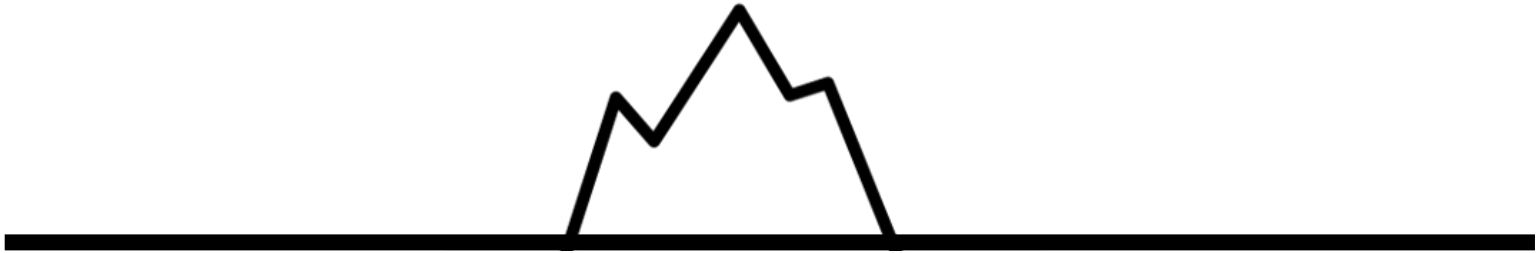
# Open Science



CLOSED

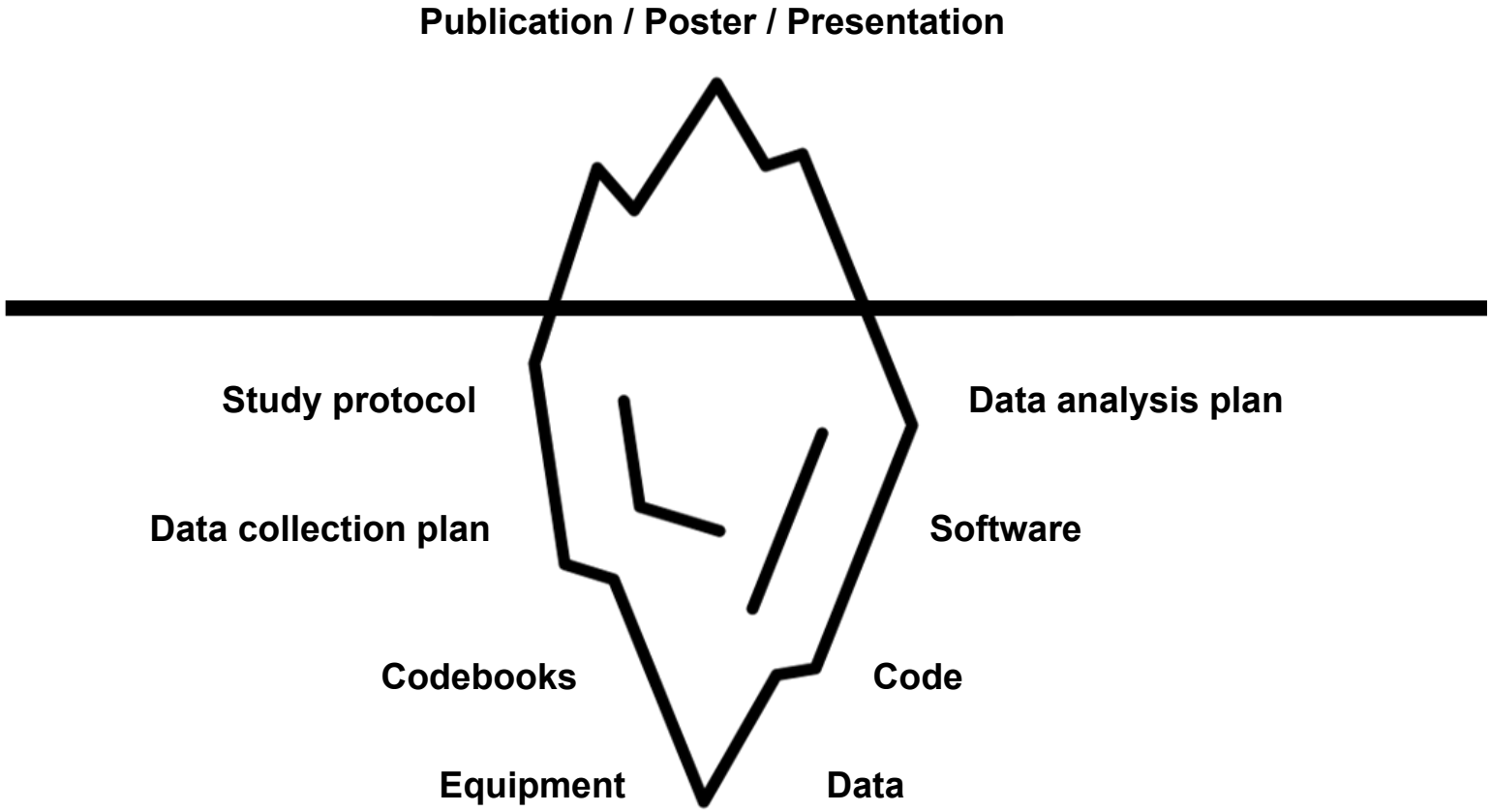
UNIVERSITY OF SASKATCHEWAN

**Publication / Poster / Presentation**



OPEN

UNIVERSITY OF SASKATCHEWAN



# What are the Benefits of Open Science?

Improves the quality, integrity, and transparency of research

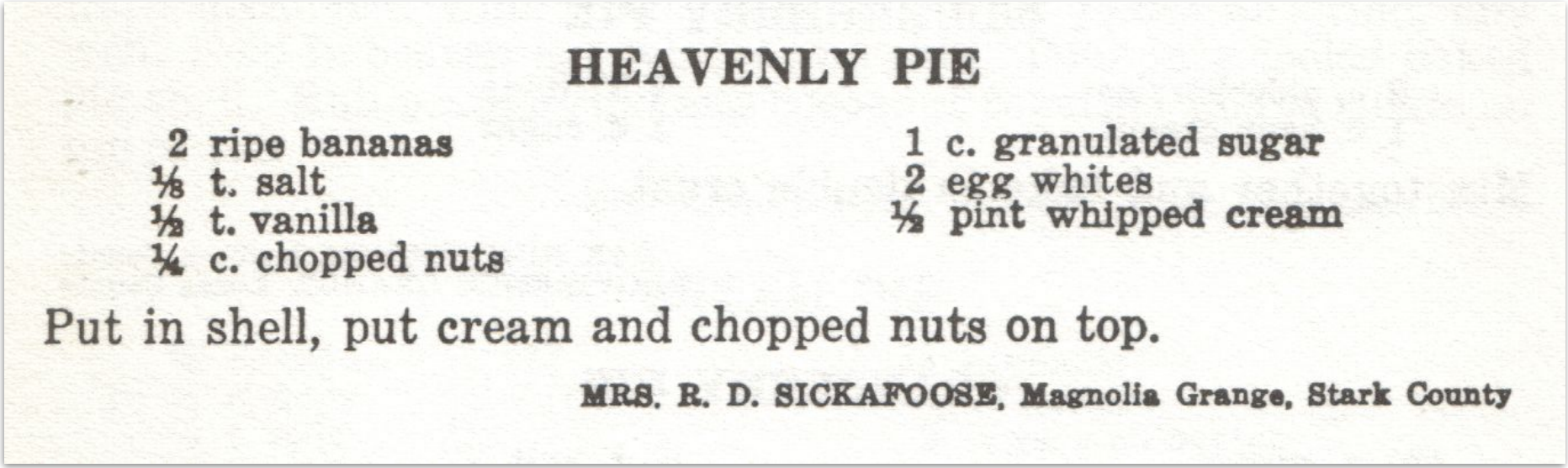
Increases efficiency in research

Research is openly available to all

Stronger engagement with the public

Increases collaboration opportunities = New/faster research

# Our example revisited



## HEAVENLY PIE

2 ripe bananas
⅛ t. salt
½ t. vanilla
¼ c. chopped nuts
1 c. granulated sugar
2 egg whites
½ pint whipped cream

Put in shell, put cream and chopped nuts on top.

MRS. R. D. SICKAFOOSE, Magnolia Grange, Stark County

http://1.bp.blogspot.com/-vHN5EzfAmBA/Vbesj-Aq12I/AAAAAAAACq8/C1bQmrJaKq4/s1600/heavenly%2Bpie.png

# The Closed Research Process

Heavenly Pie

=

Published journal article

# An Open Research Process

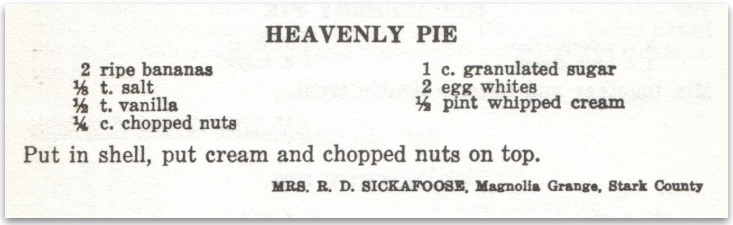
Heavenly Pie

=

Published journal article

Clear Instructions (e.g., whip egg whites)

+



HEAVENLY PIE

2 ripe bananas
⅛ t. salt
½ t. vanilla
¼ c. chopped nuts
1 c. granulated sugar
2 egg whites
½ pint whipped cream

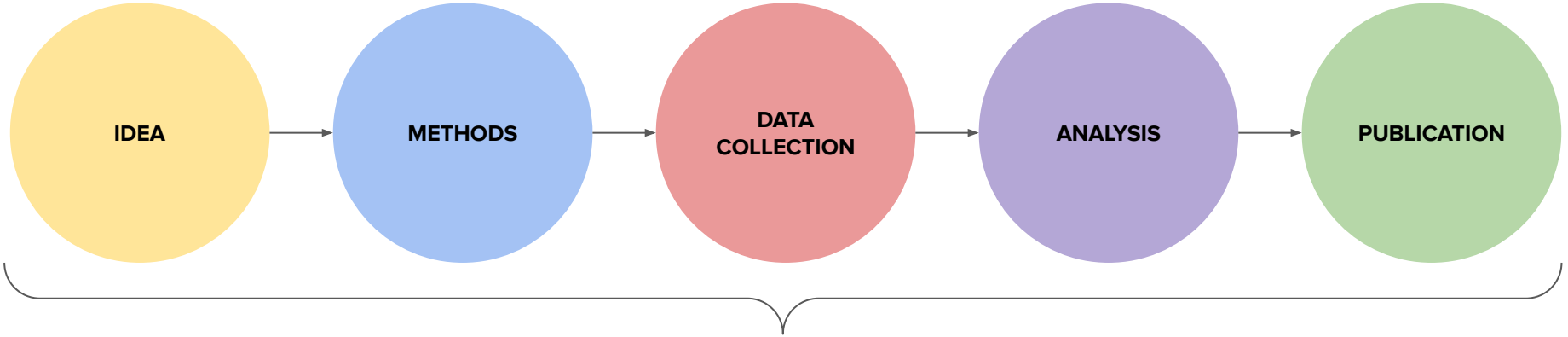
Put in shell, put cream and chopped nuts on top.

MRS. R. D. SICKAFOOSE, Magnolia Grange, Stark County

=

Data, Methods, Resources

# Open Science: Transparency is key




Clear instructions on how work is done

Opportunity for peer review at any stage

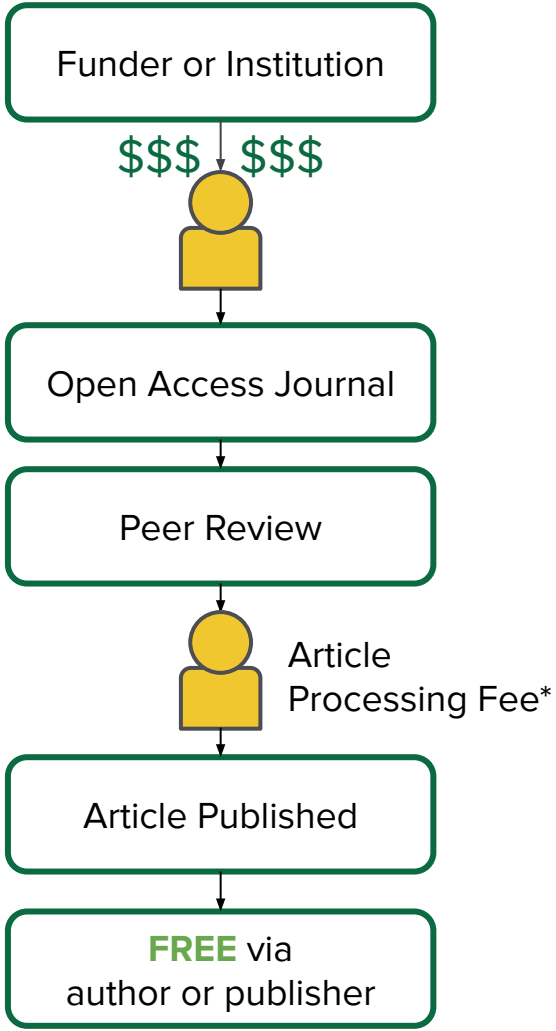
Access to products of research at each stage

# Publishing: *Open Access*

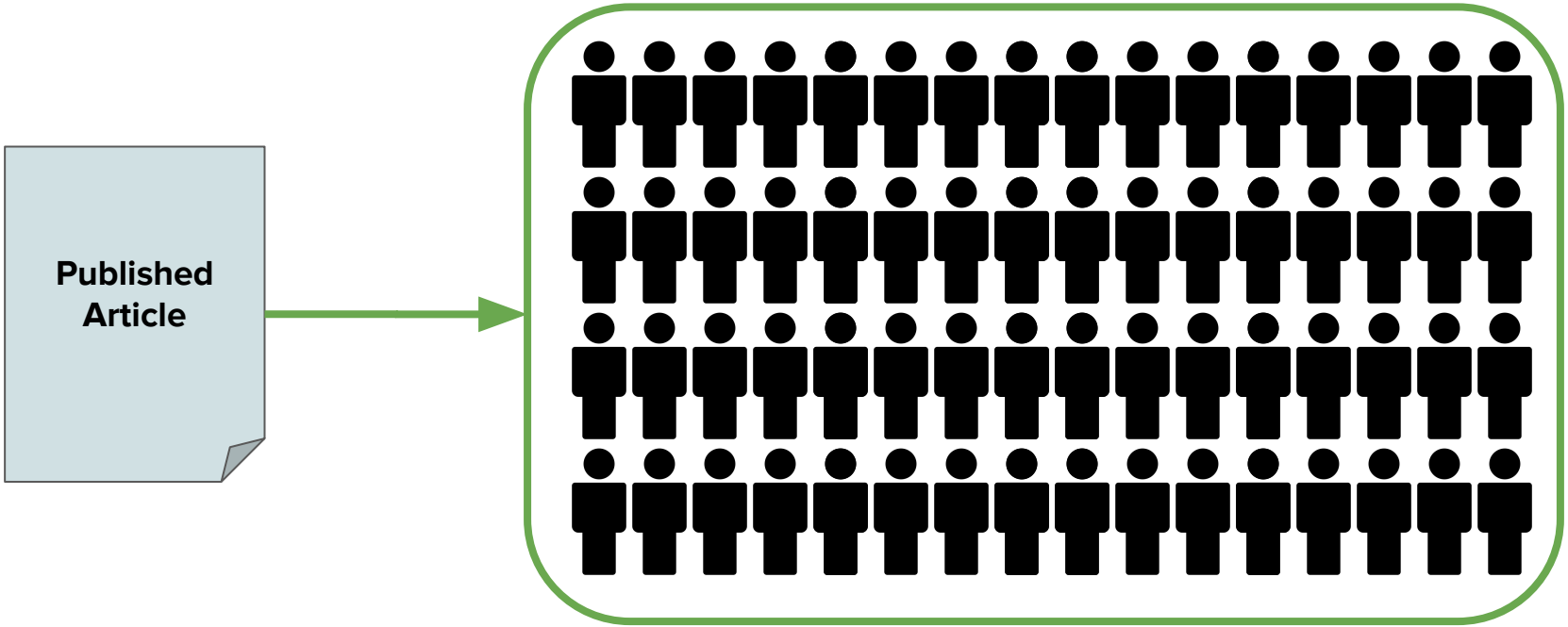
Research publications are available and accessible by anyone

Usually free of copyright so can be reused by others

Are cited more often that subscription based journals



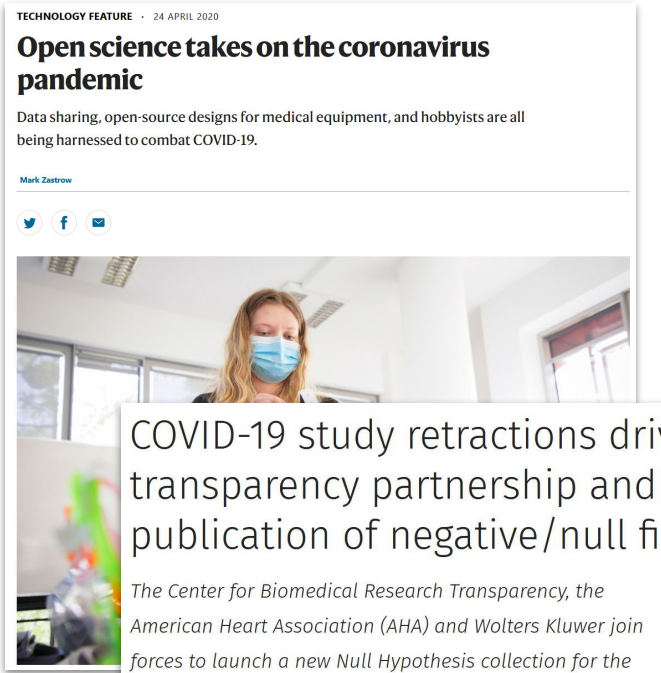
# Open Science: Open Access Model



# What does open science look like in action?

# Covid-19 Research

https://www.nature.com/articles/d41586-020-01246-3



TECHNOLOGY FEATURE · 24 APRIL 2020

## Open science takes on the coronavirus pandemic

Data sharing, open-source designs for medical equipment, and hobbyists are all being harnessed to combat COVID-19.

Mark Zastrow



## The key to finding a cure for COVID-19? Open science

GUY ROULEAU
CONTRIBUTED TO THE GLOBE AND MAIL
PUBLISHED JULY 10, 2020

6 COMMENTS SHARE

00:00 Voice 1x


TRENDING

1 Trudeau cautions against extremism in John A. Macdonald statue debate

2 Over 65? Pay attention to your protein intake
LESLIE BECK

3 Gordon Pape: My growth portfolio is high risk, but it's generating incredible returns

4 Canada's bank regulator rolling back loan deferral programs for banks, insurers

https://www.theglobeandmail.com/opinion/article-the-key-to-finding-a-cure-for-covid-19-open-science/

## COVID-19 study retractions drive research transparency partnership and push for increased publication of negative/null findings

*The Center for Biomedical Research Transparency, the American Heart Association (AHA) and Wolters Kluwer join forces to launch a new Null Hypothesis collection for the AHA's scientific journals portfolio*

CONTACTS

André Rebelo
*Sr. Global Public Relations Manager*

Health

https://www.thelancet.com/journals/landig/article/PIIS2589-7500(20)30082-0/fulltext

https://www.wolterskluwer.com/en/news/covid-19-study-retractions-drive-research-transparency-partnership

## Data sharing in the era of COVID-19

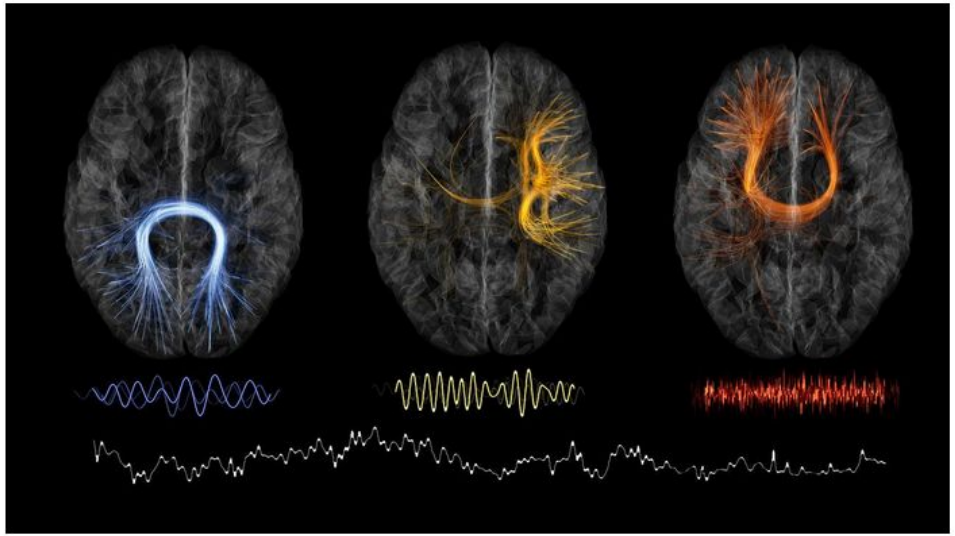
Christopher V Cosgriff · Daniel K Ebner · Leo Anthony Celi

Open Access · Published: May, 2020 · DOI: https://doi.org/10.1016/S2589-7500(20)30082-0

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) continues to test the capacity of world health systems. Since the outbreak started, the global community has learned about coronavirus disease 2019 (COVID-19), the disease resulting from SARS-CoV-2. In the first few weeks of the pandemic, knowledge about the disease and its treatment was generated from sharing of anecdotal observations and small case series. Although health-care professionals use modern technology to communicate, never before has the failure to build robust data-sharing systems for large-scale near real-time analysis in health care been more obvious.

In the era of electronic health records, physiologic, laboratory, imaging, decision-making, and treatment data are continuously recorded. Inferences drawn from these data can inform epidemiological inquiries and guide treatment protocols when clinical trial data do not exist or might be too slow to inform a rapidly evolving situation. While the number of trials increases, real-time treatment data accumulates, siloed within hospital systems. When considering COVID-19, the insight we could gain from a pooled, publicly available dataset analysed by researchers in academic institutes and industry is invaluable and necessary.

# Montreal Neurological Institute



The Montreal Neurological Institute plans to free up its findings, including data that point to connections between brain regions communicating at different neural rhythms. SÉBASTIEN DERY, MCCONNELL BRAIN IMAGING CENTRE, MONTREAL NEUROLOGICAL INSTITUTE

## Montreal institute going 'open' to accelerate science

By Brian Owens | Jan. 21, 2016 , 2:00 PM

https://www.sciencemag.org/news/2016/01/montreal-institute-going-open-accelerate-science

# Canada's Roadmap


http://science.gc.ca/eic/site/063.nsf/eng/h_97992.html

*"It will be required that federally-funded research publications, data, and materials be made openly available by January 2023."*

# Where to start with Open Science?

# Throughout the research process, ask yourself:

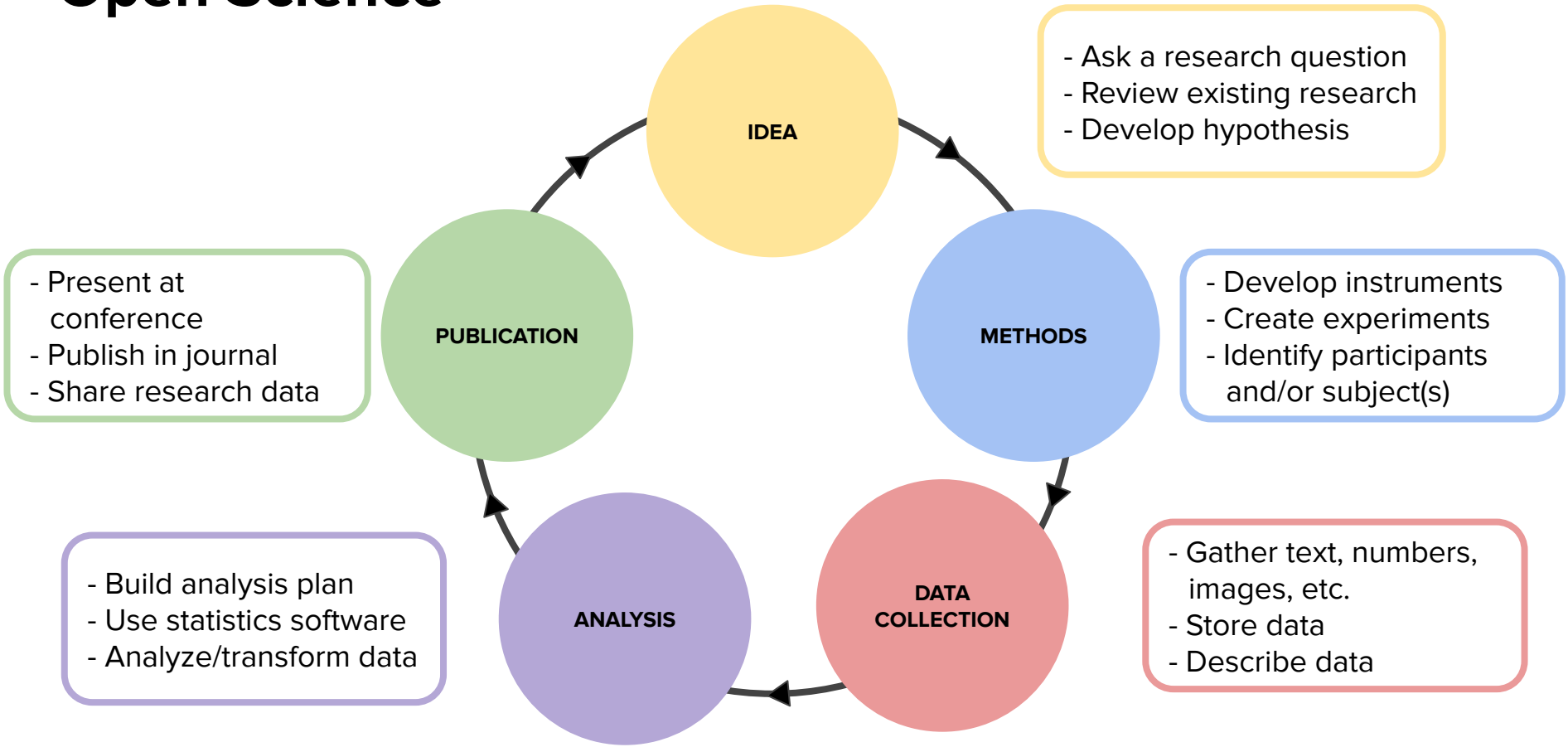
How can I share what I’m doing with others from the very beginning of the process?

Can I hold myself accountable for what I’ve set out to do?

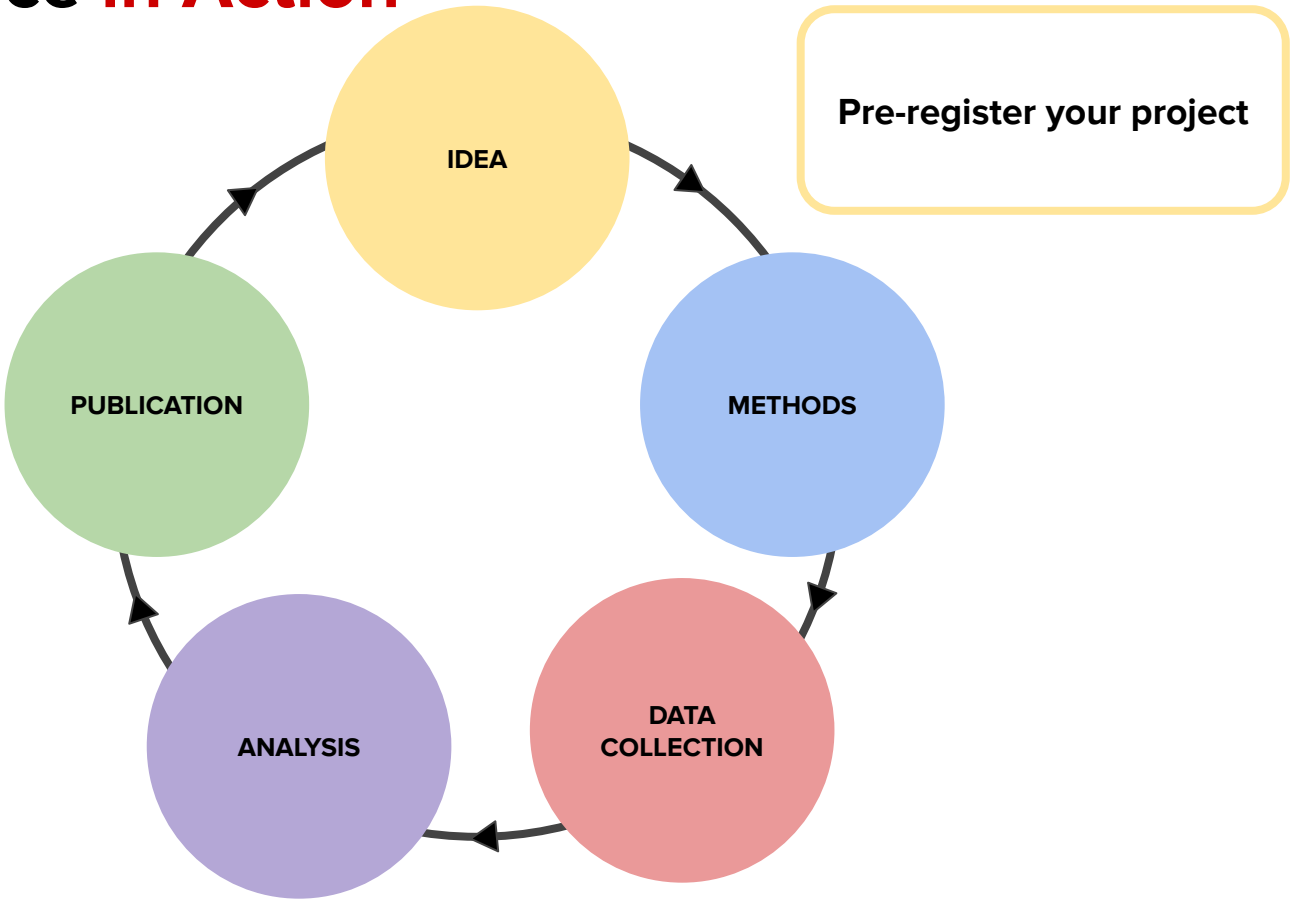
Will others be able to understand what I’m doing/have done?

Will my work be accessible to everyone?

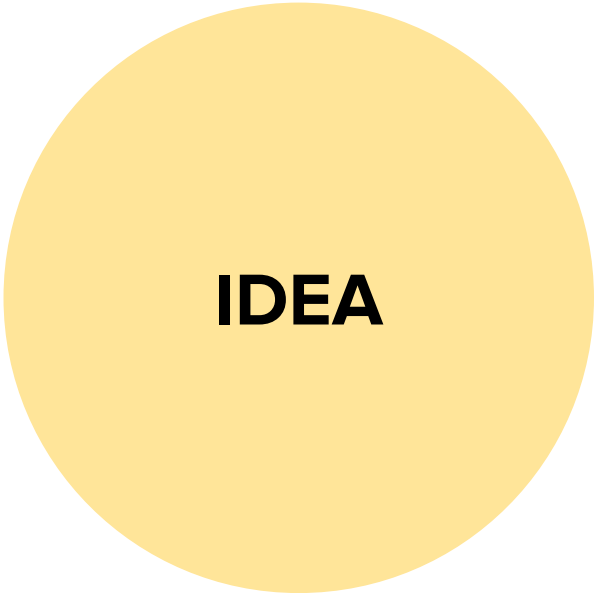
# Open Science



# Open Science in Action



# Open Science in Action: Preregistration

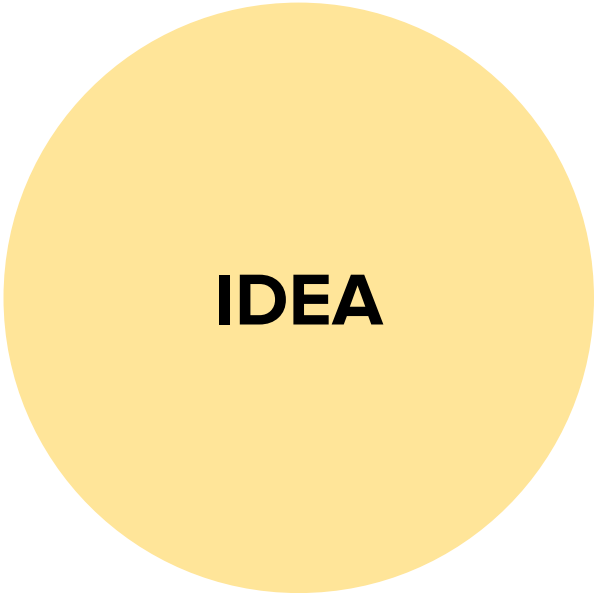



Releasing your research question and study design BEFORE beginning your project

**Benefits:**

- Allows for feedback at the beginning of your project
- Eliminates bias
- Ensures reproducibility of results
- Lets people know research is being done on this topic

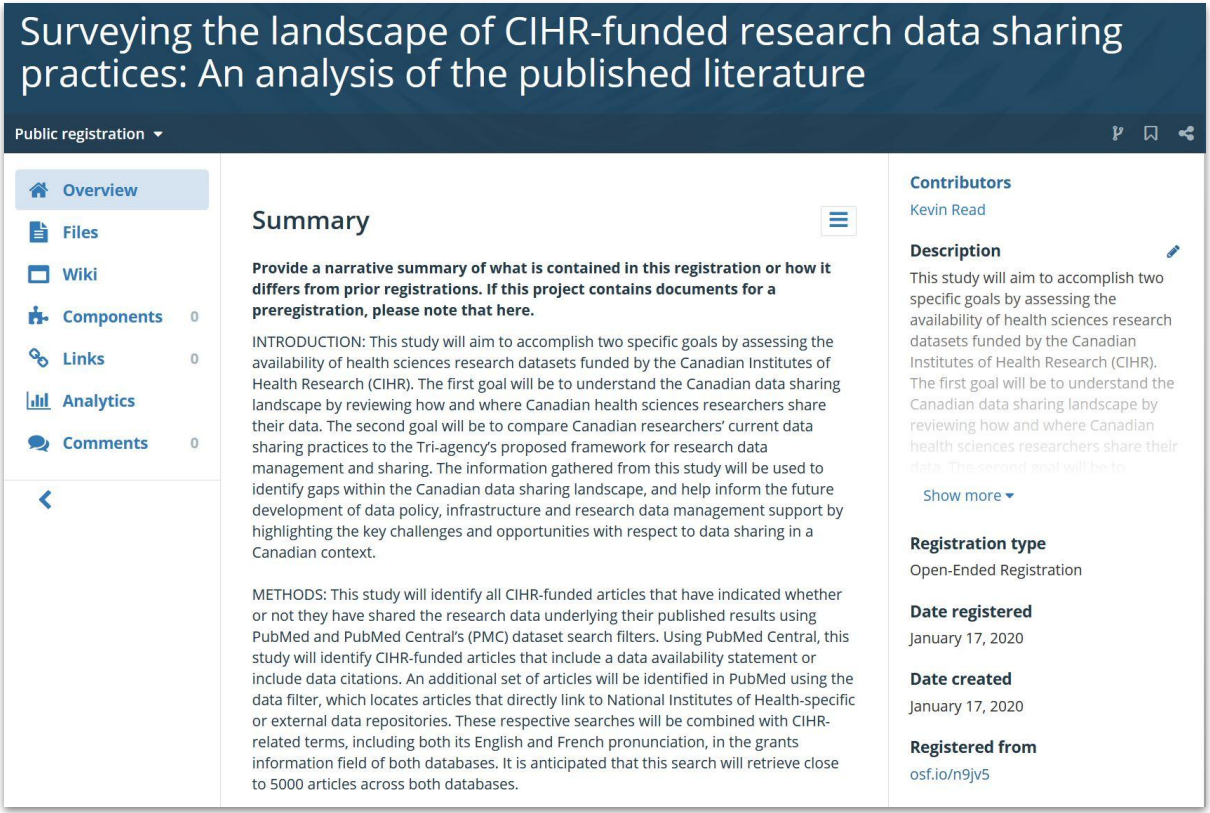
# Open Science in Action: Preregistration




**Example Preregistration Template:**

- Research Question
- Study Description/Justification
- Study Design
- Data Collection Procedures
- Variables being studied (e.g., frequency of caffeine consumption)

# Open Science in Action: Pre-registration



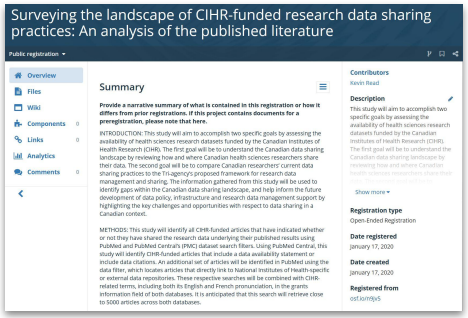

https://osf.io/wjgdb

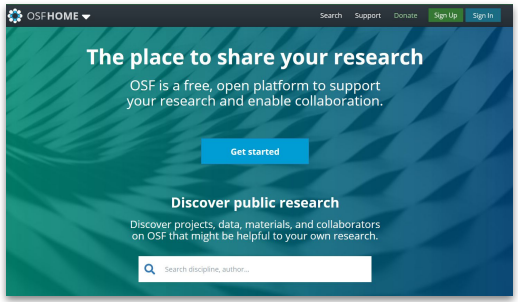
# Checkpoint 1: Uploading your research question

Publicly share your research question and justification before starting your research

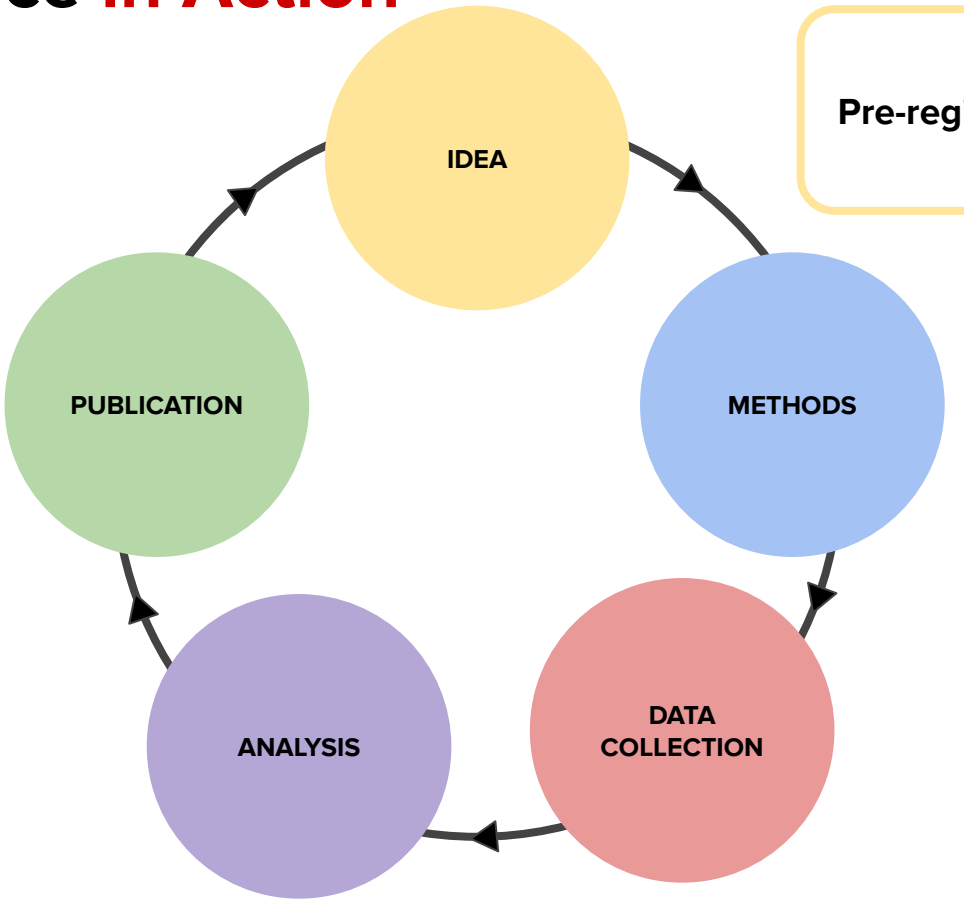
Consider:

- Communicating your research question and justification in plain language
- Will be a viewers first exposure to your research
- Always include your names so that you can be credited



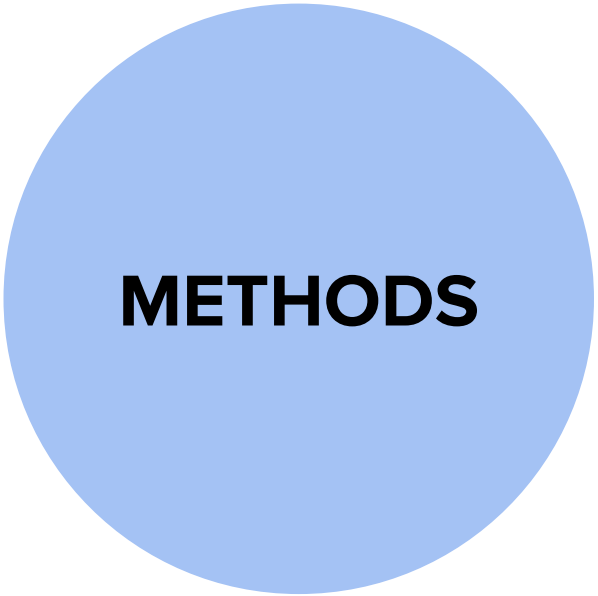
# Open Science in Action




Pre-register your project

Share your methods, instruments, etc. when possible

# Open Science in Action: Sharing Methods and Tools

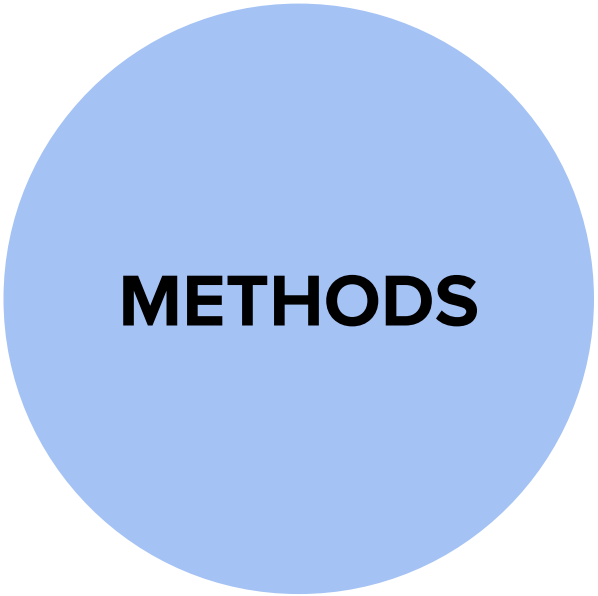



Sharing the instruments, tools, etc. that you create will allow people to see **HOW** you are conducting your research

**Benefits:**

- Eliminates bias
- Allows others to potentially use your instruments/tools for their own research
- Opportunity to gain feedback from peers
- Provides an opportunity for you to make your research understandable to others

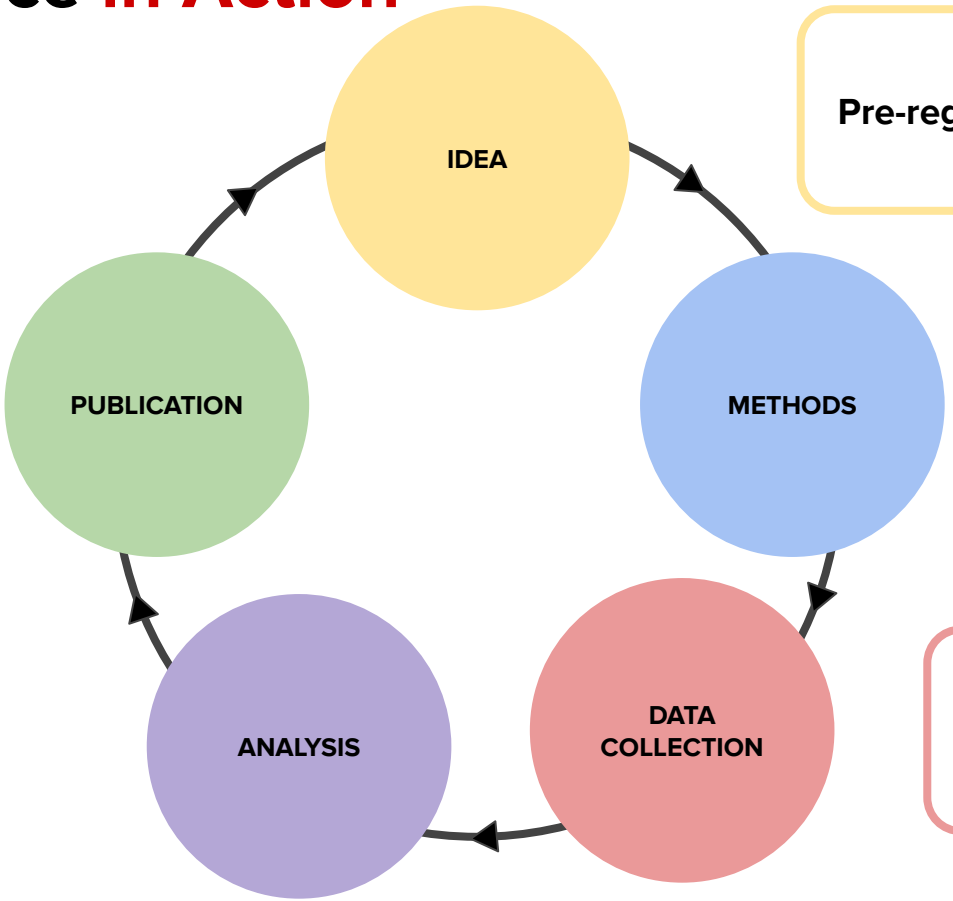
# Open Science in Action: Sharing Methods and Tools




**Example:**

- Describing an experiment
- Sharing a questionnaire
- Sharing a survey
- Sharing the software you will use to collect data

# Open Science in Action




Pre-register your project

Share your methods, instruments, etc. when possible

Describe your data so it can be understood by others

# Open Science in Action: Make Data Understandable


Make sure everyone understands and can interpret the data that you collect.

**Benefits:**

- Your data can be understood by others
- Your data can be *reused* by others
- Your data provides a bigger picture of your research project

# Is Your Data Understandable?

??????

| p1 | p2 | p3 | p4 | p5 |
|---|---|---|---|---|
| 1 | 0 | 3 | Active | Strong |
| 1 | 0 | 3 | Inactive | Moderate |
| 4 | 0 | 2 | Unknown | Unknown |
| 3 | 1 | 5 | Inactive | Weak |
| 0 | 1 | 2 | Inactive | Weak |

# Open Science in Action: Make Data Understandable

**DATA COLLECTION**

**Example:**
Create a data dictionary of your data

**Maricopa Regional Household Activity Survey: 2001**
**Matrix of Data Items**

NuStats
Revised 4/10/01
Pg 1 of 12

| Item | Var Name | Variable Description | Data Type | Width | Values |
|---|---|---|---|---|---|
| H-1 | SAMPN | HH ID Number | N | 7 | |
| H-2 | HHADDR | Household Location Reference Number | N | 10 | |
| H-3 | AREATYPE | Area Type | N | 1 | 1=CBD, 2=Outlying CBD, 3=Mixed Urban, 4=Suburban, 5=Rural, 9=Apache Junction |
| H-4 | PHONE | HH Phone number | C | 10 | |
| H-5 | LANG | Interview Language | N | 1 | 1=English, 2=Spanish |
| H-6 | HHVEH | Number of motorized vehicles available for use by HH members | N | 2 | Ordinal Variable; 98=Don't know; 99=Refused |
| H-7 | BIKES | Number of bicycles | N | 2 | Ordinal Variable; 98=Don't know; 99=Refused |
| H-8 | HHSIZE | No. of persons in household | N | 2 | |
| H-9 | ETHN | HH Ethnicity | N | 1 | ETHN |
| H-10 | O_ETHN | Other Ethnicity | C | 30 | |
| H-11 | WRKR | Number of HH Workers | N | 2 | |
| H-12 | DWELTYPE | Type of dwelling unit | N | 1 | DWELTYPE |
| H-13 | DWELO | Other type of dwelling | C | 30 | |
| H-14 | OWN | Owner/Renter Status | N | 1 | 1=Own/buying; 2=Rent; 7=Other, 8=DK, 9=RF |
| H-15 | O_OWN | Other Owner/Renter Status | C | 30 | |
| H-16 | TENURE | Tenure at dwelling unit | N | 1 | 1=<1 yr, 2=1-3 yrs, 3=4-5 yrs, 4=more than 5 yrs, 9=DK/RF |
| H-17 | COMPTR | Computer Ownership Status | N | 1 | 1=Yes; 2=No; 8=DK; 9=RF |
| H-18 | INTERNET | Internet Service Status | N | 1 | 1=Yes; 2=No; 8=DK; 9=RF |
| H-19 | INTACC | Internet Access Type | N | 1 | 0=NONE, 1=Dial-up/Modem with tones, 2=High speed connection, 3=Web TV, 7=Other, 9=DK/RF |
| H-20 | INTACCO | Other Access Type | C | 30 | |
| H-21 | PHLNS | Number of telephone lines | N | 1 | Ordinal Variable, 98=DK, 99=RF |
| H-22 | FAXMODEM | Number of telephone lines used exclusively for Fax or Modem | N | 1 | Ordinal Variable, 98=DK, 99=RF |
| H-24 | NOPHN | Lack of phone service | N | 1 | 1=Yes; 2=No; 8=DK; 9=RF |
| H-25 | LENGTH | Lack of phone service | N | 1 | LENGTH |
| H-26 | INCAT | Income Category | N | 1 | 1=Below 35K, 2=Above 35K, 8=DK, 9=RF |
| H-27 | INCOME | Total 2000 annual household income | N | 2 | INCOME |

I:\projects\maricopa\data\bc2bd132-9b61-404b-936d-6331c24fe35d.xls

https://shatterlion.info/wp-content/uploads/2018/01/data-dictionary-template-data-dictionary-template-dfxkkz16.jpg

# Checkpoint 2: Sharing Survey Questions & Building a Data Dictionary

## Survey Q's

4. What is your current position at the University of Saskatchewan?

- ○ Undergraduate student (Canadian student)
- ○ Undergraduate student (International student)
- ○ Graduate student (Canadian student)
- ○ Graduate student (International student)
- ○ Post-doctoral fellow
- ○ Faculty/staff member
- ○ Other (please list)

## Raw data

| | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z | AA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | I consent | What is your age in years? | What is your | What is your | current positic | What best de | Do you cı | Have you | Do you hı | Do you cı | What forms of social media do you currently use? (Choose all that apply) | | | | | | | |
| 2 | Response | Open-Ended Response | Response | Response | Other (please | Response | Respons | Respons | Respons | Respons | Facebook | Twitter | Instagran | Reddit | Pinterest | YouTube | LinkedIn | Blogs (e |
| 3 | 1 | 19 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | 4 | 5 | 6 | | |
| 4 | 1 | | | | | | | | | | | | | | | | | |
| 5 | 1 | 24 | 1 | 1 | | 2 | 1 | 2 | 1 | 2 | 1 | | 3 | | 5 | 6 | | |
| 6 | 1 | 27 | 2 | 3 | | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 4 | | 6 | 7 | |
| 7 | 1 | 20 | 1 | 1 | | 2 | 1 | 2 | 1 | 2 | | | | | 5 | 6 | | |
| 8 | 1 | 19 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | | 5 | 6 | | |
| 9 | 1 | 40 | 1 | 6 | | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | | 5 | 6 | 7 | |
| 10 | 1 | 20 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | | | 6 | | |
| 11 | 1 | 21 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | | 3 | | 5 | | | |
| 12 | 1 | 39 | 1 | 6 | | 1 | 2 | 1 | 1 | 2 | 1 | | | | | 6 | | |
| 13 | 1 | 27 | 1 | 6 | | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 3 | 4 | | 6 | | |
| 14 | 1 | 38 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | | | | 5 | 6 | | |
| 15 | 1 | 18 | 1 | 1 | | 1 | 1 | 1 | 3 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 16 | 1 | 32 | 1 | 1 | | 3 | 1 | 1 | 2 | 2 | 1 | | 3 | | 5 | | | |
| 17 | 1 | 21 | 2 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 4 | | 6 | 7 | |
| 18 | 1 | 21 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | | 2 | | 4 | | 6 | | |
| 19 | 1 | 18 | 1 | 1 | | 2 | 1 | 1 | 1 | 2 | 1 | | 3 | 4 | 5 | | | |
| 20 | 1 | 21 | 2 | 1 | | 1 | 1 | 1 | 2 | 2 | 1 | | 3 | 4 | | 6 | | |
| 21 | 1 | 25 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | | 3 | 4 | | | | |
| 22 | 1 | 26 | 2 | 4 | | 2 | 1 | 1 | 1 | 2 | 1 | 2 | | 4 | | 6 | 7 | |
| 23 | 1 | 30 | 1 | 1 | | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 24 | 1 | 20 | 1 | 1 | | 3 | 1 | 1 | 1 | 2 | | | 3 | 4 | | 6 | | |
| 25 | 1 | 20 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | | 3 | | 5 | 6 | | |
| 26 | 1 | 21 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | | 5 | 6 | 7 | |
| 27 | 1 | 28 | 1 | 6 | | 1 | 1 | 2 | 1 | 2 | 1 | | | | | 6 | | |
| 28 | 1 | 50 | 1 | 0 | auditing stude | 1 | 1 | 1 | 2 | 1 | | | | | | | | |
| 29 | 1 | 23 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | | 5 | | 7 | |
| 30 | 1 | 19 | 1 | | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | | 5 | 6 | | |
| 31 | 1 | 23 | 1 | 1 | | 1 | 1 | 1 | 2 | 2 | 1 | | 3 | | 5 | 6 | | |
| 32 | 1 | 37 | 1 | 6 | | 1 | 1 | 1 | 1 | 2 | 1 | | 3 | | 5 | 6 | 7 | |
| 33 | 1 | 23 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | | | | 5 | 6 | | |
| 34 | 1 | 20 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | | 5 | 6 | | |
| 35 | 1 | 19 | 1 | 1 | | 1 | 1 | 1 | 2 | 2 | | | 3 | | | 6 | | |
| 36 | 1 | 21 | 1 | 1 | | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 4 | | 6 | 7 | |
| 37 | 1 | 63 | 1 | 6 | | 1 | 1 | 2 | 1 | 2 | | 2 | | | | 6 | 7 | |
| 38 | 1 | 28 | 2 | 1 | | 1 | 2 | 1 | 1 | 2 | 1 | | 3 | 4 | | 6 | 7 | |
| 39 | 1 | 19 | 1 | 1 | | 1 | 1 | 1 | 1 | 2 | | | 3 | | | | | |
| 40 | 1 | 25 | 3 | 1 | | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 3 | | | 6 | | |
| 41 | 1 | 28 | 1 | 1 | | 1 | 2 | 1 | 1 | 2 | 1 | | 3 | 4 | | 6 | | |

# Checkpoint 2: Building a Data Dictionary

**Template (Available in the Open Science Module on Canvas):**

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | **Variable Name** | **Variable Definition** | **Variable Type** | **Variable Values** | **Variable Instructions (if necessary)** |
| 2 | age_years | The age of participants in years | text | N/A | Must enter a number value for age |
| 3 | Do you take iron supplements? | Assessment of participant's iron intake | multiple choice | 0 - No; 1 - Yes; 2 - Don't Know | N/A |
| 4 | What are your three favourite foods? | Participant's top three selections of their favourite foods | checkbox | 1 - Chocolate; 2 - Pizza; 3 - Steak Dinner; 4 - Sour Patch Kids; 5 - other | Other is a free text field and can be entered in manually by participants |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |

# Checkpoint 2: Building a Data Dictionary

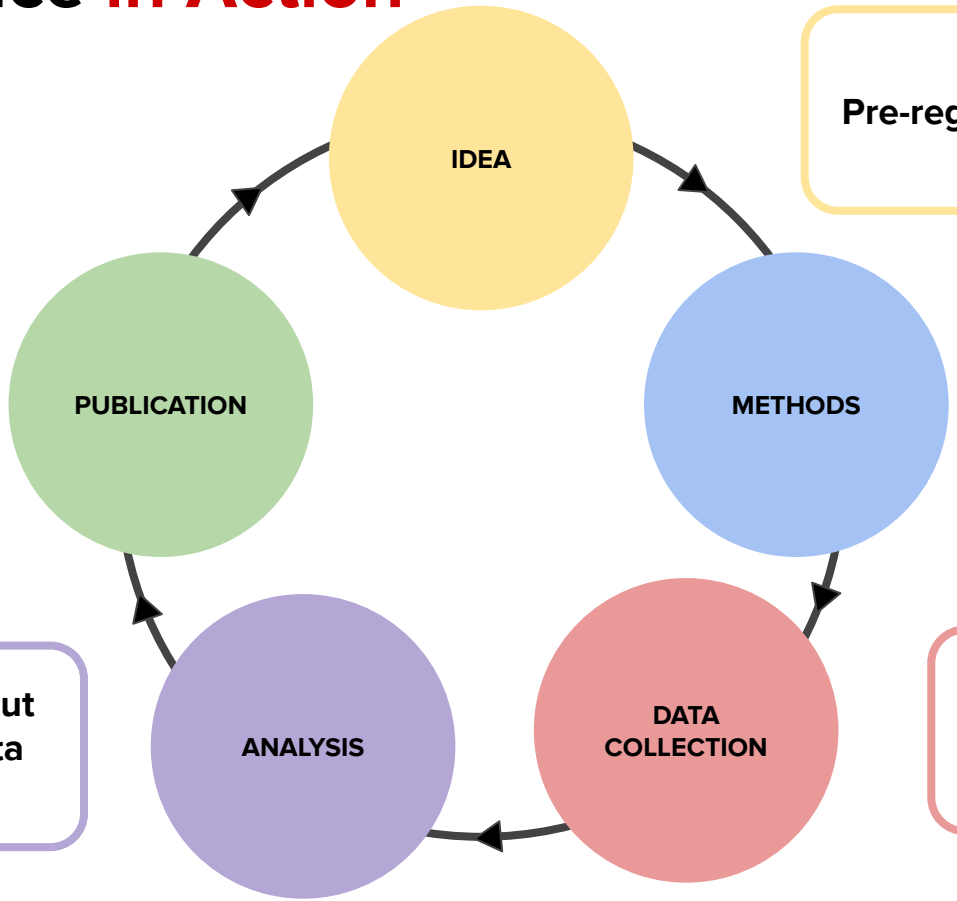
| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | **Variable Name** | **Variable Definition** | **Variable Type** | **Variable Values** | **Variable Instructions (if necessary)** |
| 2 | age_years | The age of participants in years | text | N/A | Must enter a number value for age |
| 3 | Do you take iron supplements? | Assessment of participant's iron intake | multiple choice | 0 - No; 1 - Yes; 2 - Don't Know | N/A |
| 4 | What are your three favourite foods? | Participant's top three selections of their favourite foods | checkbox | 1 - Chocolate; 2 - Pizza; 3 - Steak Dinner; 4 - Sour Patch Kids; 5 - other | Other is a free text field and can be entered in manually by participants |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |

# Checkpoint 2: Building a Data Dictionary

**FOCUS ON UNDERSTANDABILITY/TRANSPARENCY!**

| | A | B | C | D | E |
|---|---|---|---|---|---|
| 1 | **Variable Name** | **Variable Definition** | **Variable Type** | **Variable Values** | **Variable Instructions (if necessary)** |
| 2 | age_years | The age of participants in years | text | N/A | Must enter a number value for age |
| 3 | Do you take iron supplements? | Assessment of participant's iron intake | multiple choice | 0 - No; 1 - Yes; 2 - Don't Know | N/A |
| 4 | What are your three favourite foods? | Participant's top three selections of their favourite foods | checkbox | 1 - Chocolate; 2 - Pizza; 3 - Steak Dinner; 4 - Sour Patch Kids; 5 - other | Other is a free text field and can be entered in manually by participants |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |
| 8 | | | | | |
| 9 | | | | | |

# Open Science in Action




Pre-register your project

Share your methods, instruments, etc. when possible

Describe your data so it can be understood by others

Be transparent about and share your data analysis plan

# Open Science in Action: Build an analysis plan


Provide a description of how you will explore your data after it has been collected.

**Benefits:**

- Holds you accountable to how you will analyze your data
- Eliminates the risk of manipulation of data
- Provides clear instructions to a user about how you transformed your data

# Open Science in Action: Build an analysis plan


**Examples:**

- “I created pivot tables using the height and weight variables”
- “We averaged the caffeine consumption of adults between the ages of 20 and 25”
- “We examined how frequently male and female students eat breakfast by looking at the **gender** and **student_bkfst** variables”

# What is included in a data analysis plan?

A summary of what the document is about

A description of every data analysis procedure you complete, including:

- The type of analysis (e.g, average, mean, count)
- The variables you analyzed and the value your are exploring (e.g., gender = female, coffee consumption = 5 times a day)
- Any figures or summary results that you found

Reference/link to your survey and/or data dictionary for more context

# Example: My own research

**Analysis 1: Counting Data Sharing Methods**

Using the data collection instrument: *CIHR-funded Data Sharing Instrument*, we counted (using COUNT= function in Microsoft Excel) the methods of data sharing.

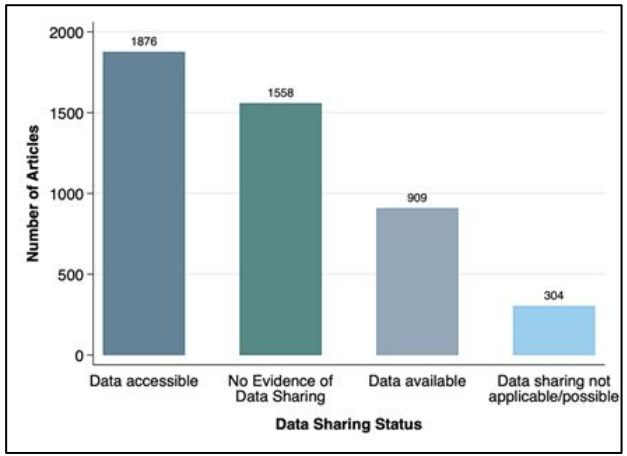
**Variables used:**

- Is data available? = 1
- Is data accessible? = 1
- Was data sharing not possible? = 1
- Was there no evidence of data sharing? = 1

**Related documents:**

- CIHR-funded Data Sharing Instrument
- Data Dictionary

**Generated figure:**



# Example: My own research continued...

**Analysis 1: Counting Data Sharing Methods**

Using the data collection instrument titled: CIHR-funded Data Sharing Instrument, we counted the different methods of data sharing.

**Variables used:**

- Is data available? = 1
- Is data accessible? = 1
- Was data sharing not possible? = 1
- Was there no evidence of data sharing? = 1

**Related documents:**

- CIHR-funded Data Sharing Instrument
- Data Dictionary

**Analysis 2: Averaging CIHR-funded Data Accessibility**

We averaged the total number of times a researcher with CIHR-funded made their research data accessible to the public.

**Variables used:**

- Grant agency = 1 and Is data accessible? = 1

**Related documents:**

- CIHR-funded Data Sharing Instrument
- Data Dictionary

# Example: My own research continued...

**Analysis 1: Counting Data Sharing Methods**

Using the data collection instrument titled: CIHR-funded Data Sharing Instrument, we counted the different methods of data sharing.

**Variables used:**

- Is data available? = 1
- Is data accessible? = 1
- Was data sharing not possible? = 1
- Was there no evidence of data sharing? = 1

**Related documents:**

- CIHR-funded Data Sharing Instrument
- Data Dictionary

**Analysis 2: Averaging CIHR-funded Data Accessibility**

We averaged the total number of times a researcher with CIHR-funded made their research data accessible to the public.

**Variables used:**

- Grant agency = 1 and Is data accessible? = 1

**Related documents:**

- CIHR-funded Data Sharing Instrument
- Data Dictionary

Title

Description

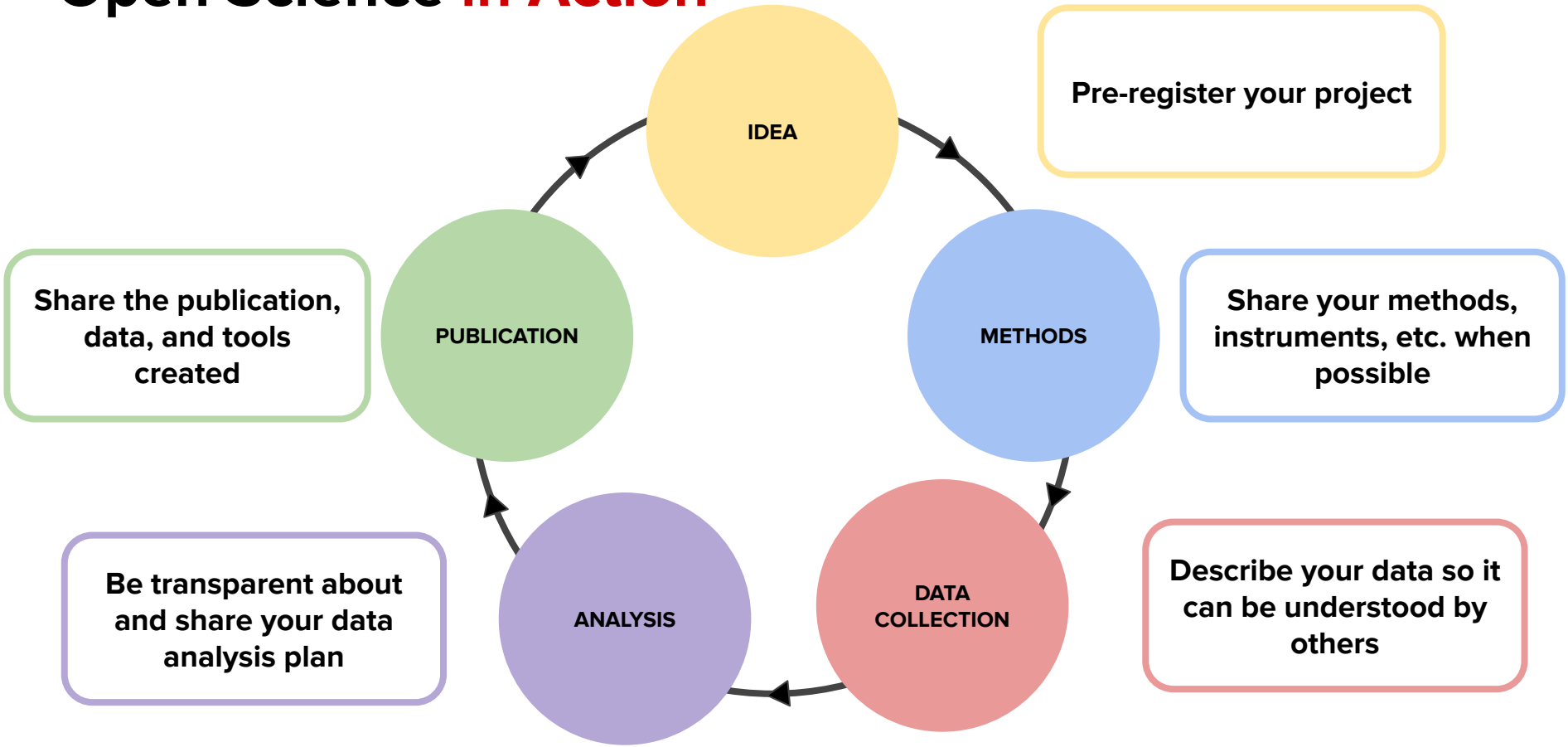
Variables w/ values

Related documents

Repeat for each new analysis

University of Saskatchewan

# Open Science in Action



# Open Science in Action: Share your research


Share all products of research including your final paper, data (when possible), conference presentation, poster, software, etc.

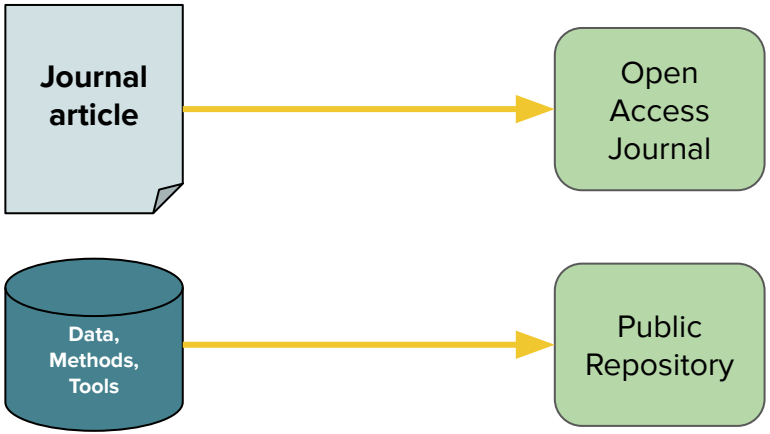
**Benefits:**

- Others can see the full breadth of your research
- Your research will be reproducible
- You research will accessible to everyone

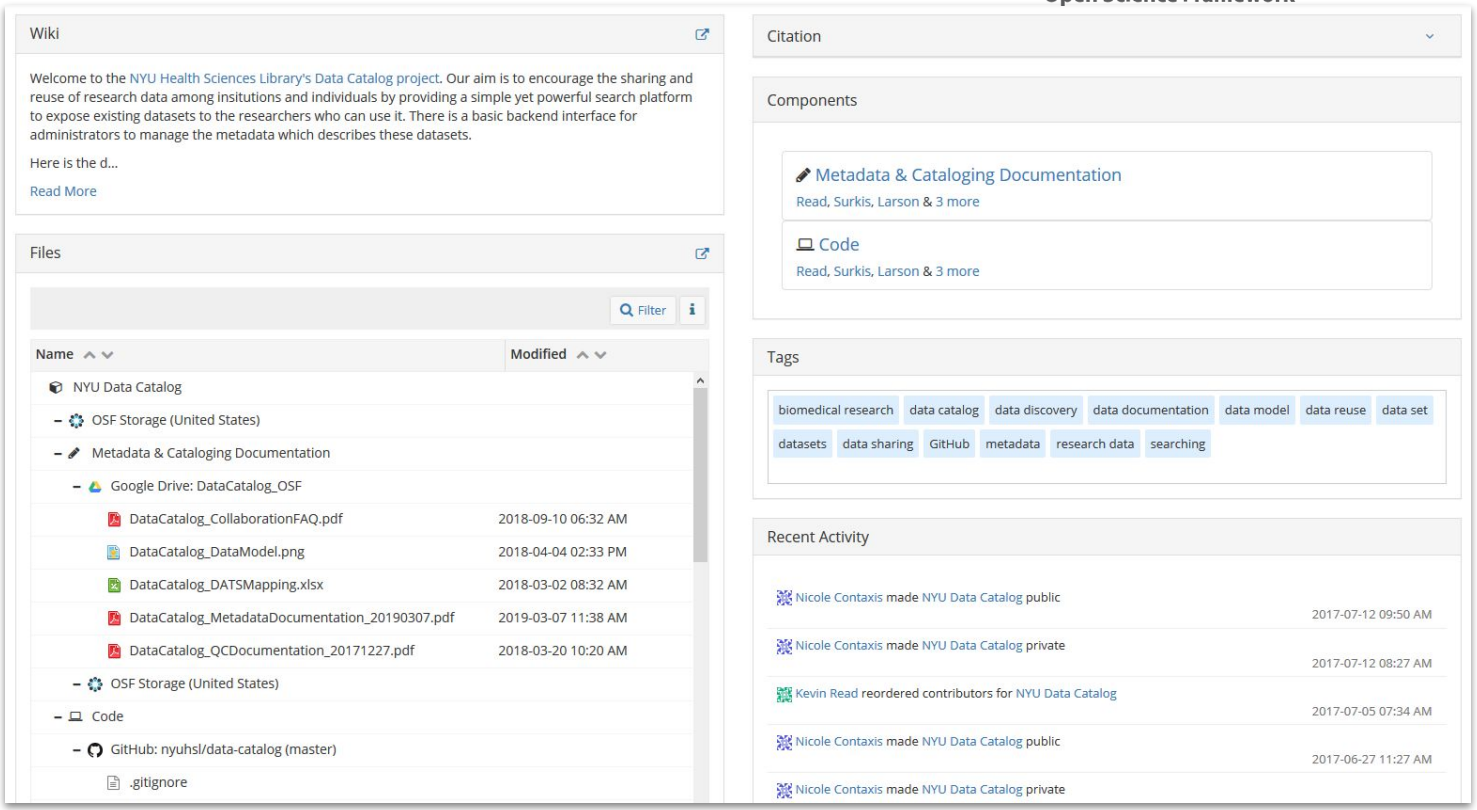
# Open Science in Action: Share your research

PUBLICATION

**Examples:**

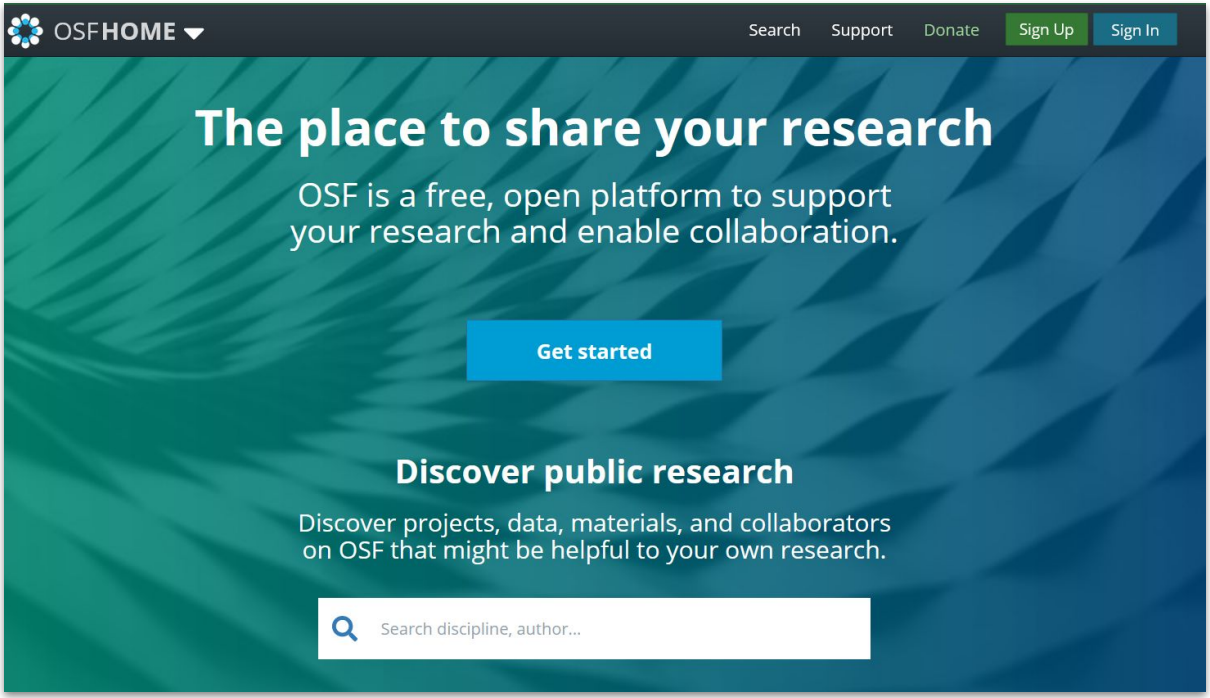


# Open Science Framework (OSF)



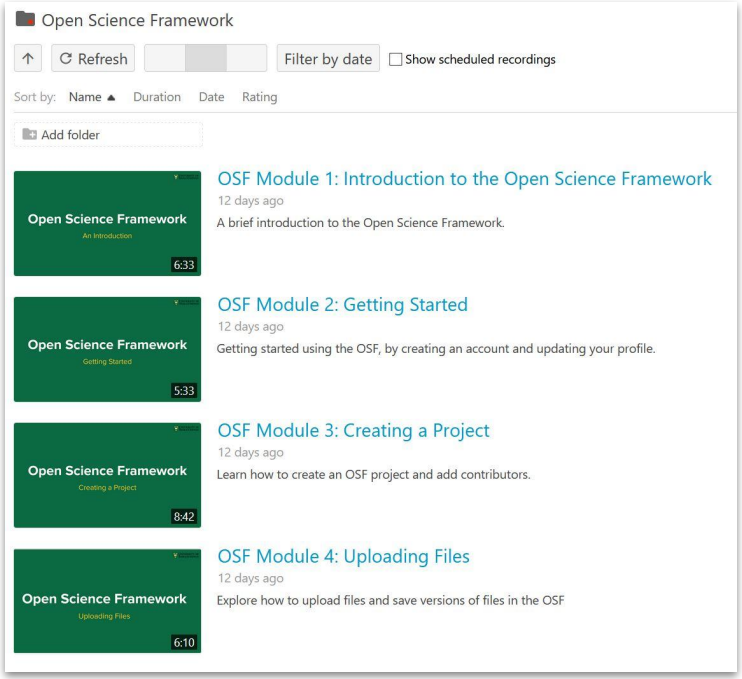

https://osf.io/

# Exercise: Create an OSF Account




https://osf.io/

# Open Science Framework Panopto Videos

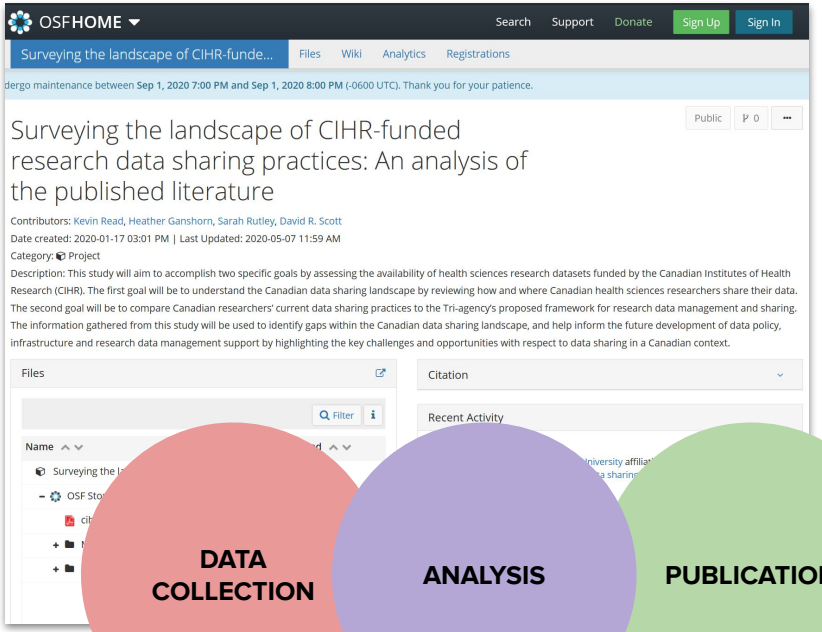


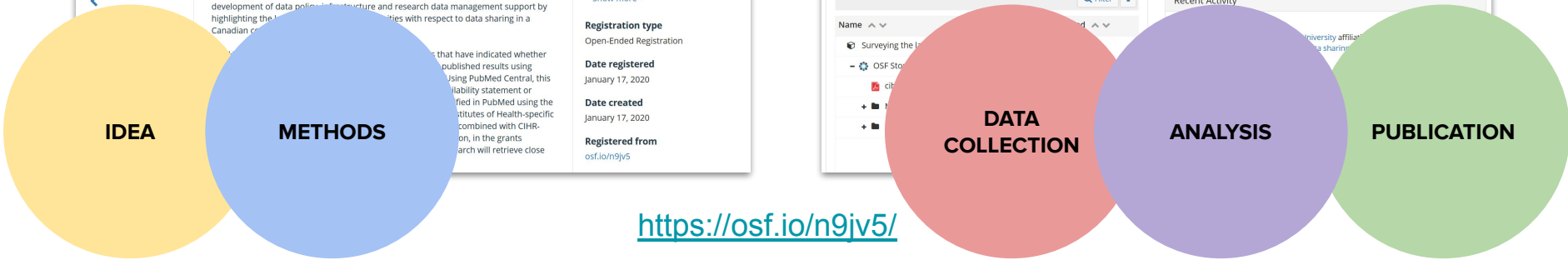

https://usask.cloud.panopto.eu/Panopto/Pages/Sessions/List.aspx?folderID=655bd58f-9927-4ad0-a414-ac2a0106df48

# Open Science in Action: My Own Research

## Preregistration


## Research Products Available Online

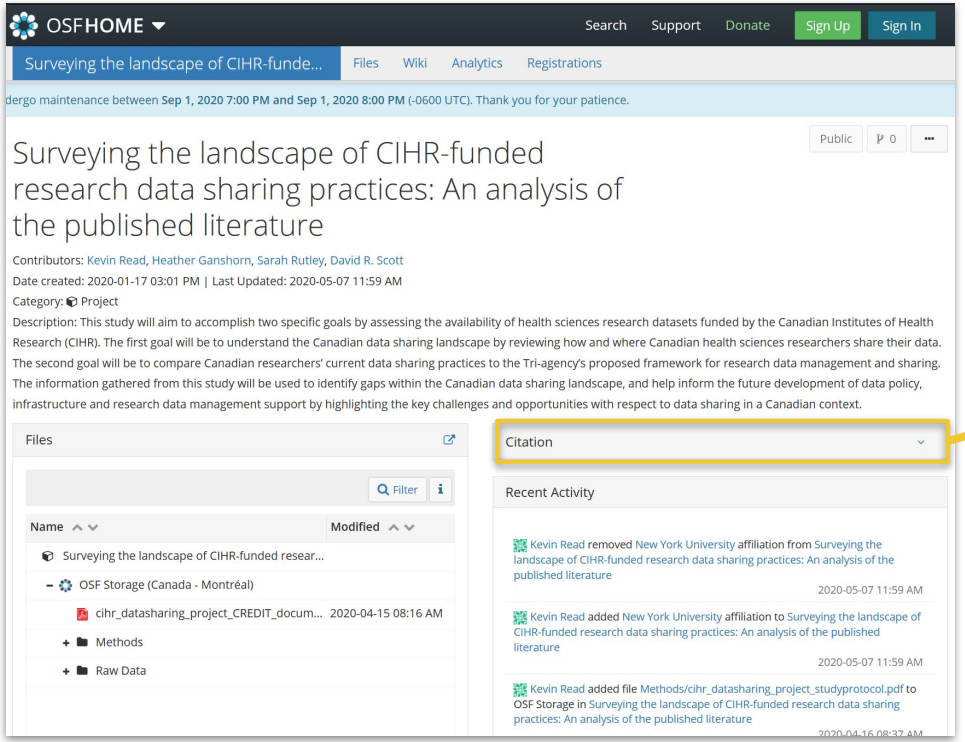


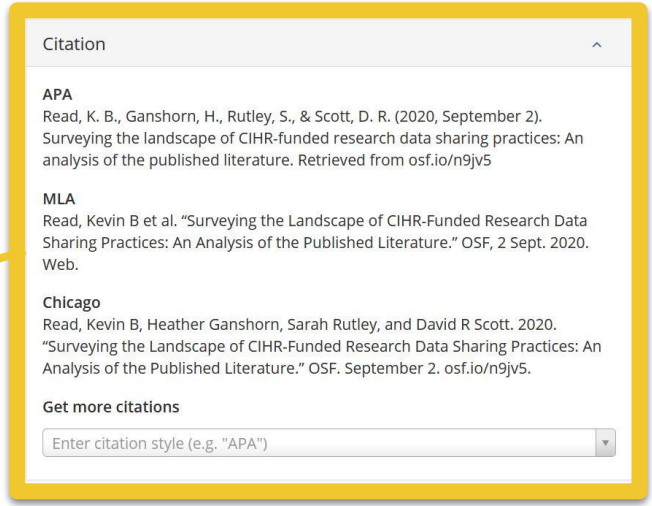




https://osf.io/n9jv5/

# Open Science in Action: Getting Credit

## Research Products Available Online

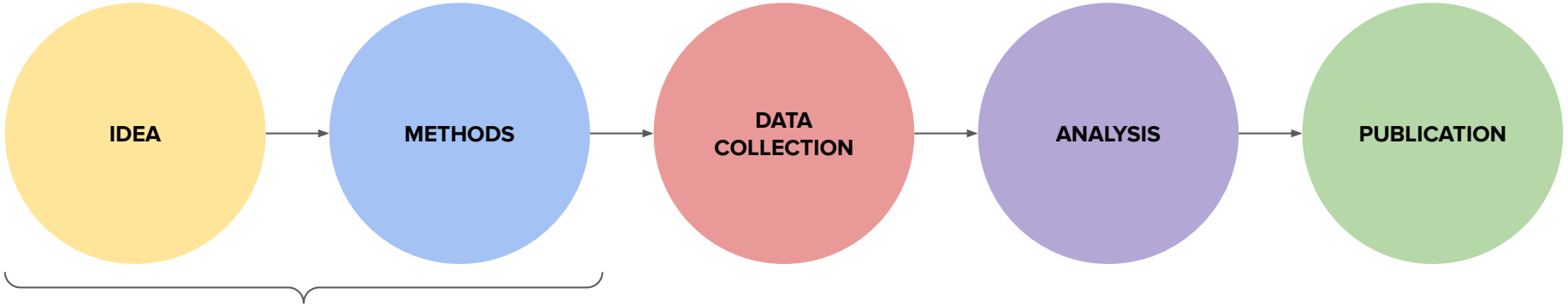



https://osf.io/n9jv5/

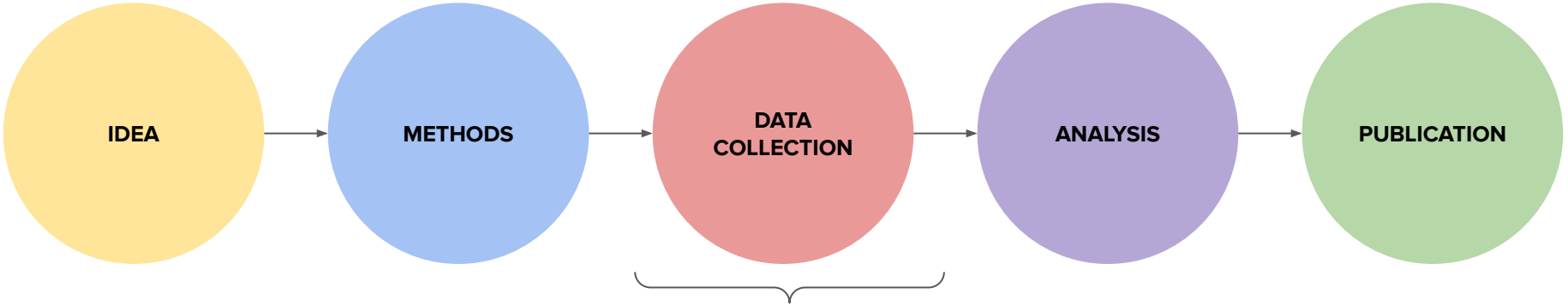
# Open Science: Transparent process

# Open Science: Transparent process

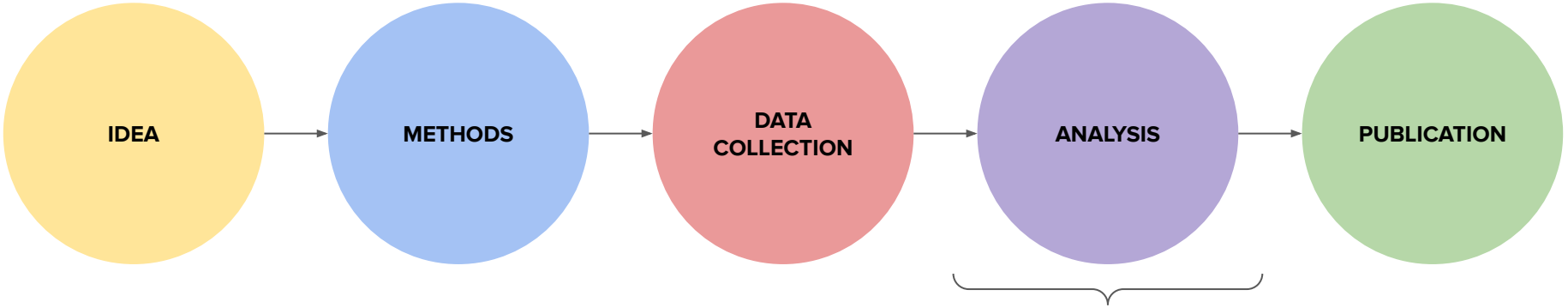



Preregister study
Share methods, instruments, tools

# Open Science: Transparent process

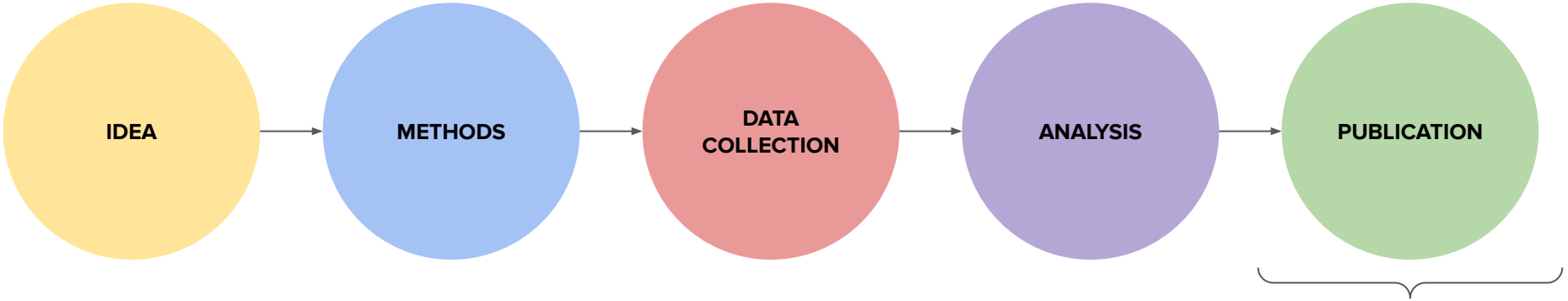


# Open Science: Transparent process

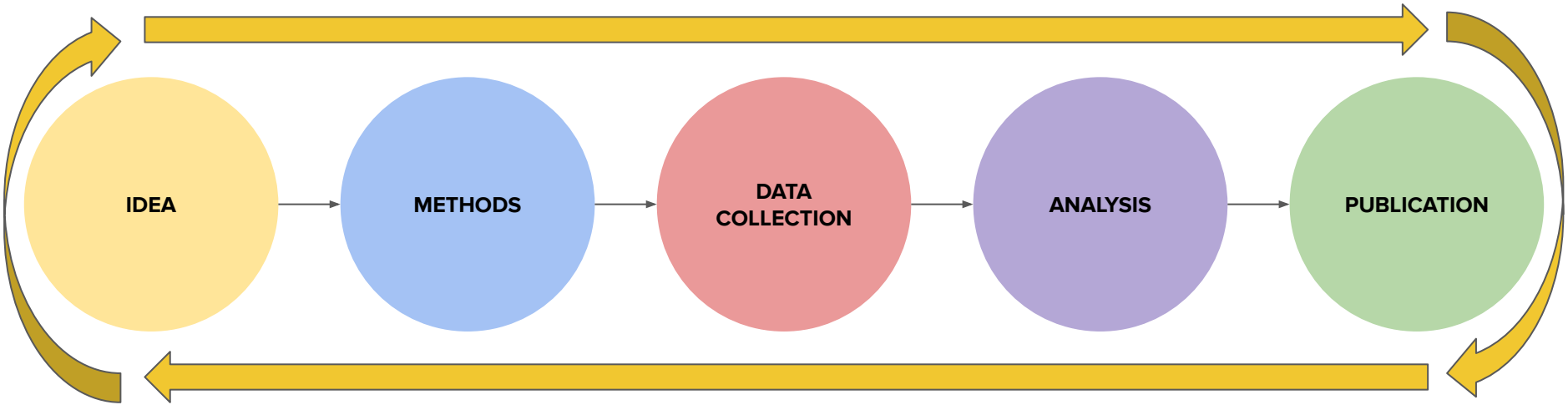



Describe data analysis
Share data analysis plan

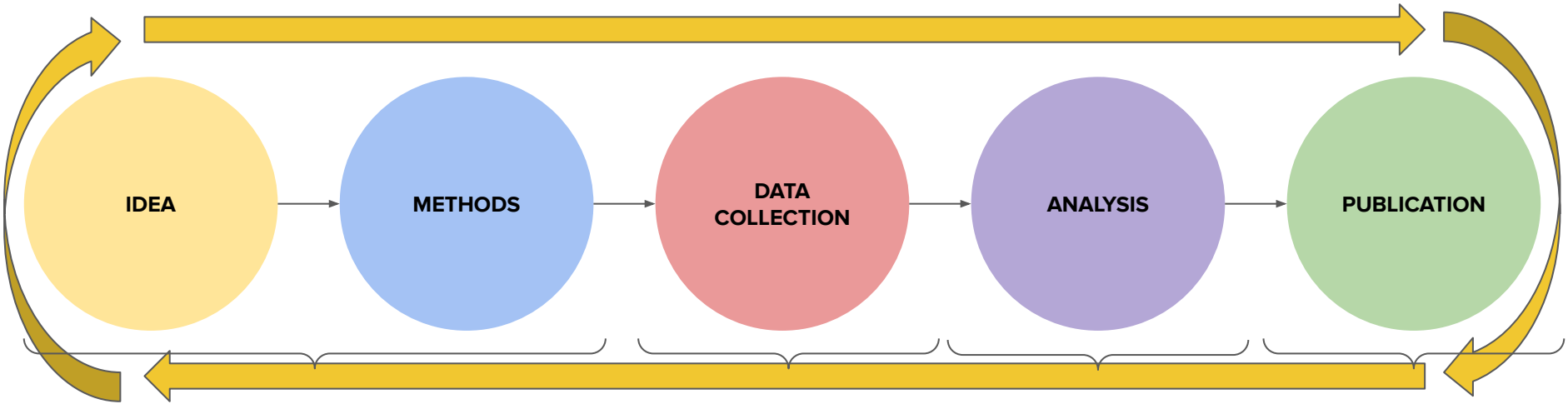
# Open Science: Transparent process



# Open Science: Transparent ONGOING process



# Open Science: Provides access to new material




Preregister study
Share methods, instruments, tools

Create data dictionary

Describe data analysis
Share data analysis plan

Share poster
Share data

University of Saskatchewan

# Open Science in NUTR 230

# Open Science Checkpoints

| Checkpoint | Open Science Component |
|---|---|
| ***Checkpoint 1:*** Submission of Research Question and Justification | Students create a collaborative **OSF** project and upload the finalized research question and justification. Share the link on the project pages of Canvas. **Due: Sept 21** |
| ***Checkpoint 2:*** Submission of Survey Questions | Student create a data dictionary of their survey questions and upload to their **OSF** project. **Due: Oct 7** |
| ***Checkpoint 3:*** Submission of Draft Introduction & Methods Section of Poster | Students upload their introduction and methods to their **OSF** project. **Due: Nov 5** |
| ***Checkpoint 4:*** Data Analysis Progress and Draft Poster | Students write a summary of the analysis procedures they have applied to the data and upload it to their **OSF** project. **Due: Nov 25** |
| ***Final product:*** Completed poster | Students upload their completed poster to their **OSF** project and cite their OSF project in their poster. **Due: Nov 30** |

# Open Science Checkpoints: File Naming

Before uploading documents to the Open Science Framework, use this file naming convention for clarity:

*projectname_documenttype_YYYYMMDD[date]*

**Examples:**

studentexerciselevels_datadictionary_20200901

caffeineconsumption_researchquestion_20201029

plantbaseddiets_introandmethods_20200812

# Summary

Consider the value of making your research openly available

Continually ask yourself whether your project would be understandable to someone unfamiliar with you work

Complete the checkpoints with the idea that your research could be viewed by anyone

Open science practices can improve the quality and transparency of research for the better!

# Resources

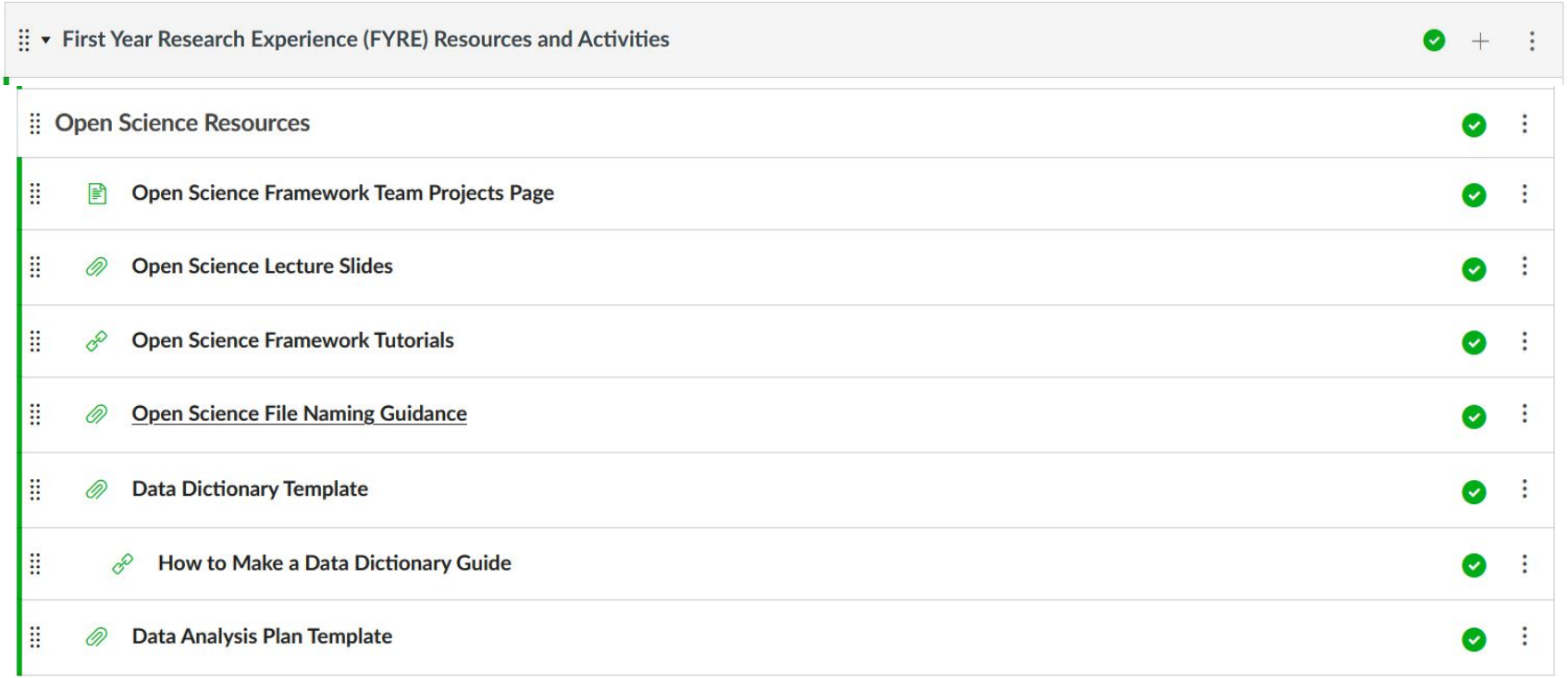
FYRE-specific Open Science Framework Training Videos: https://usask.cloud.panopto.eu/Panopto/Pages/Sessions/List.aspx?folderID=655bd58f-9927-4ad0-a414-ac2a0106df48

How to Make a Data Dictionary: https://help.osf.io/hc/en-us/articles/360019739054-How-to-Make-a-Data-Dictionary

What is Open Science? https://www.fosteropenscience.eu/node/2269

Comprehensive Open Science Framework Guides: https://help.osf.io/hc/en-us

# Canvas Modules



# References


Allen C, Mehler DMA (2019) Open science challenges, benefits and tips in early career and beyond. PLOS Biology 17(12): e3000587. https://doi.org/10.1371/journal.pbio.3000587

Goodman, S. N., Fanelli, D., & Ioannidis, J. P. A. (2016). What does research reproducibility mean? *Science Translational Medicine*, *8*(341), 341ps12 LP-341ps12. https://doi.org/10.1126/scitranslmed.aaf5027

Society, T. R. (2012). *Science as an open enterprise* (Issue June). The Royal Society. https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/

University of Saskatchewan

# Questions?

kevin.read@usask.ca

(or ask in the Canvas FYRE Lounge)