Scientific Reproducibility in Biology Research

an introduction

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Scientific Reproducibility

- Clear path/paper trail from data to scientific conclusions from experiment
- Reviewer can follow and understand logical/statistical reasoning
- Within-lab and between lab collaborations possible
- Version control

Reproducibility is an essential component of research integrity

Scientific Reproducibility: A checklist

- Well-organised directories/files
- R projects
- Well-annotated code: analysis workflow
- Data in .csv or .xlsx formats, single (raw) version
- Data accessible, easy to import and wrangle
- Exploratory analysis through data visualisations

Does point-click software (e.g. Prism/Graphpad) meet the reproducibility challenge?

Scientific Reproducibility and R

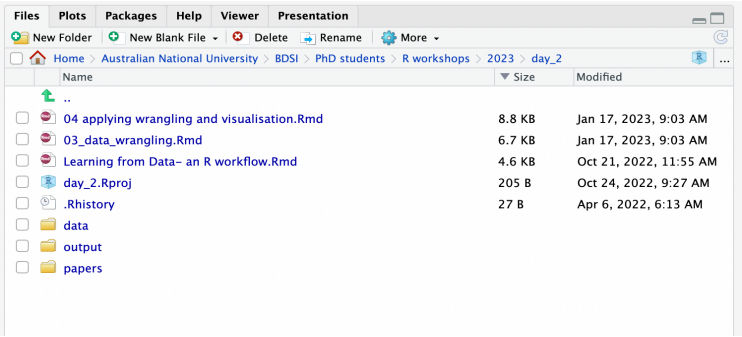
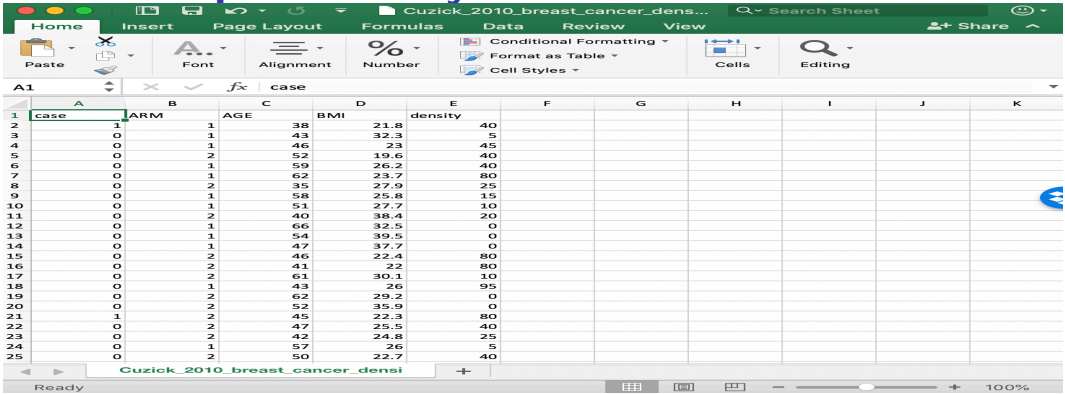


Figure 1: Well-organised directories/files

Scientific Reproducibility and R



	A	B	C	D	E	F	G	H	I	J	K
1	case	ARM	AGE	BMI	density						
2	1	1	38	21.8	40						
3	0	1	43	32.3	5						
4	0	1	46	23	45						
5	0	2	52	19.6	40						
6	0	1	59	26.2	40						
7	0	1	62	23.7	80						
8	0	2	35	27.9	25						
9	0	1	58	25.8	15						
10	0	1	51	27.7	10						
11	0	2	40	38.4	20						
12	0	1	66	32.5	0						
13	0	1	54	39.5	0						
14	0	1	47	37.7	0						
15	0	2	46	22.4	80						
16	0	2	41	22	80						
17	0	2	61	30.1	10						
18	0	1	43	26	95						
19	0	2	62	29.2	0						
20	0	2	52	35.9	0						
21	1	2	45	22.3	80						
22	0	2	47	25.5	40						
23	0	2	42	24.8	25						
24	0	1	57	26	5						
25	0	2	50	22.7	40						

Figure 2: Data in .csv or .xlsx formats, single (raw) version

Scientific Reproducibility and R

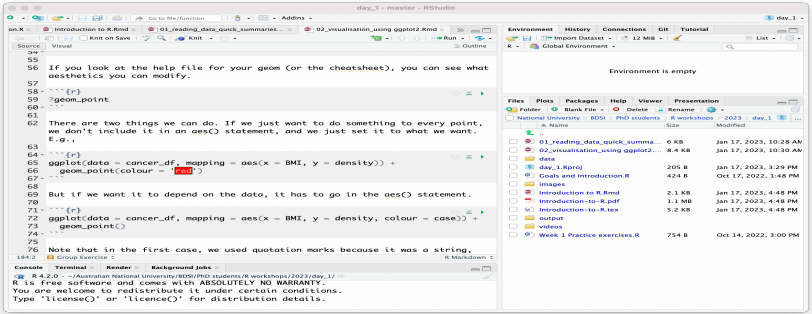


Figure 3: Well-annotated code: analysis workflow

What we cover TODAY

- R projects
- data import
- data summaries
- data visualisation using ggplot2 package

How to get the MOST from these workshops

- PRACTICE
- ask questions in class and on email
- PRACTICE
- go online and ask google
- PRACTICE on your data

Moving towards a culture of reproducibility

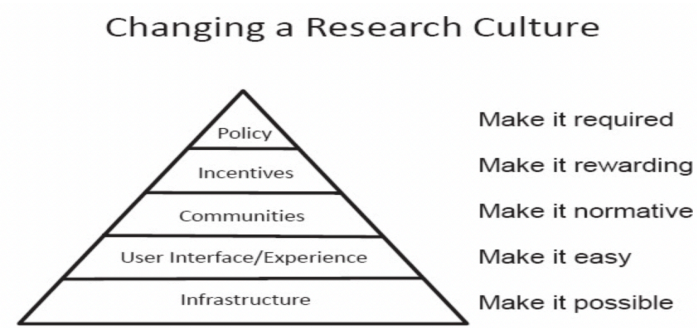


FIGURE 3-1 Pyramid model for effecting cultural change in science

SOURCE: Nosek presentation, September 25, 2019.

References:

- R for Data Science: https://r4ds.had.co.nz
- Wizemann. (2020). Enhancing Scientific Reproducibility in Biomedical Research Through Transparent Reporting : Proceedings of a Workshop. National Academies Press.