How to avoid Data Disaster

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Data

Numbers, names, dates, …

Graphs, images, …

Organised in tables, list,

Popular file formats: txt, csv, xls

1st Rule

Always, always **RAW** data

NOT

- processed,
- filtered
- manipulated

either electronically or manually

1st Rule - Why?

Maintain consistency

- Data format
- Codes (M/F)
- Separator , ; \t

Reduce human errors

- Copy / Paste / Cut
- Deletion
- Addition unwanted characters

Reduce machine errors

- Cell formats
- Save file with a different extension

2nd Rule

Maintain consistency

Example 1

PatientID	Sex	Date of birth
1	M	01-01-2013
2	f	04-18-1998
3	Male	1st of April 2004
4	Female	NA
5	F	2010/03/12
6	F	
7	M	10012012

Example 1

- Consistency: F, female, f, fem, 2, …
- Single common format for all dates: YYYYMMDD, YYYY-MM-DD
    - http://www.iso.org/iso/home/standards/iso8601.htm
- Consistency about missing values
- NA (not available), NULL,   , ...

Example 1 corrected

PatientID	Sex	Date of birth
1	M	2013-01-01
2	F	1998-04-18
3	M	2004-04-01
4	F	NA
5	F	2010-03-12
6	F	NA
7	M	2012-01-10

A bit more about consistency

Realistic and easy to understand

- Variable names
- File names

Unique and consistent variable names

- Multiple tables

3rd Rule

Missing values = NA

Blank spaces

Careful!!!

- Blank cell ≠ space
- “Male” ≠ “ Male “
- Last line: “ “

These can be a headache later on!

Example 2

PatientID	Date	Value
1	2015-06-14	213
2		76.5
3	2016-06-18	32
4		120.3
5		109
6	2015-06-20	
7		143

Example 2

Fill in all cells!

- Problems when sorting

Empty cell:

- Missing value?
- Value meant to be repeated multiple times?

Make sure it’s clear that the data is **missing** and not **unintentionally left blank**

Example 2 corrected

PatientID	Date	Value
1	2015-06-14	213
2	2015-06-14	76.5
3	2016-06-18	32
4	2016-06-18	120.3
5	2016-06-18	109
6	2015-06-20	NA
7	2015-06-20	143

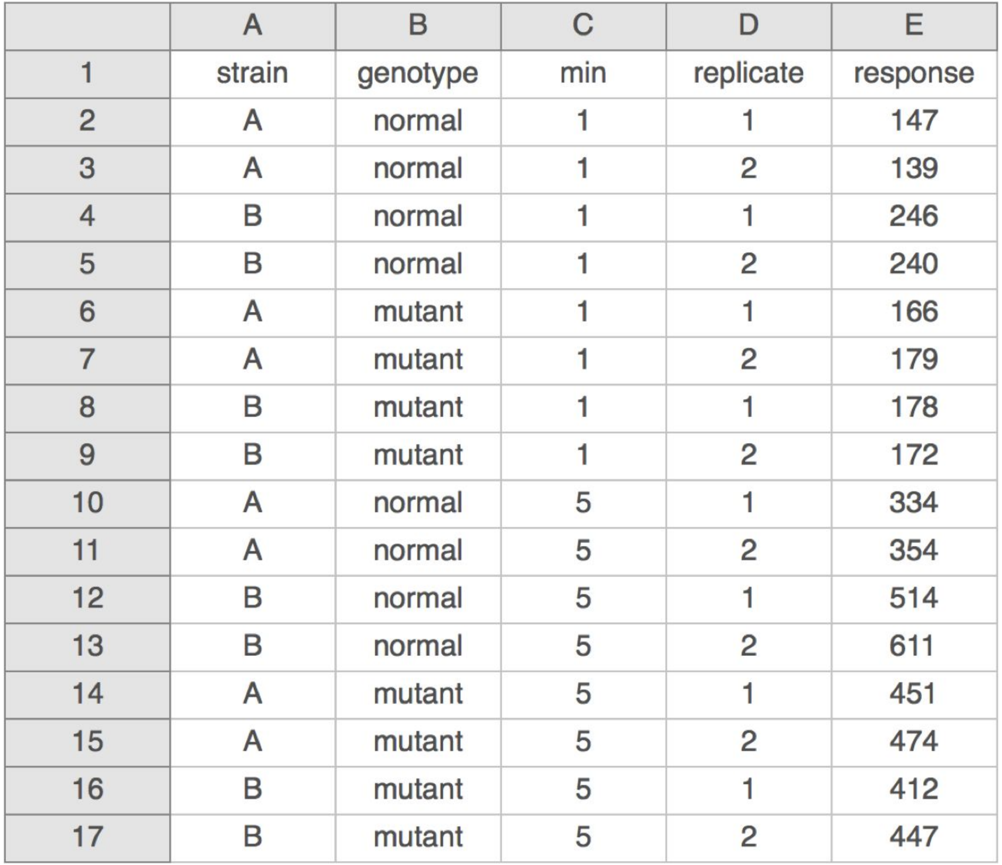
4th Rule

Make it RECTANGLE

Example 3

	A	B	C	D	E	F	G	H	I
1		1 min				5 min			
2	strain	normal		mutant		normal		mutant	
3	A	147	139	166	179	334	354	451	474
4	B	246	240	178	172	514	611	412	447

Example 3 corrected



	A	B	C	D	E
1	strain	genotype	min	replicate	response
2	A	normal	1	1	147
3	A	normal	1	2	139
4	B	normal	1	1	246
5	B	normal	1	2	240
6	A	mutant	1	1	166
7	A	mutant	1	2	179
8	B	mutant	1	1	178
9	B	mutant	1	2	172
10	A	normal	5	1	334
11	A	normal	5	2	354
12	B	normal	5	1	514
13	B	normal	5	2	611
14	A	mutant	5	1	451
15	A	mutant	5	2	474
16	B	mutant	5	1	412
17	B	mutant	5	2	447

No empty cells!

More...

- Don’t put too much information in one cell
  1 cell = 1 information

- Don’t include units such as “30 g” → “g” in the column name
  - http://unitsofmeasure.org/ucum.html

- Write notes in a separate column or data dictionary or metadata
  “0 (below threshold)”

- Avoid using “,” or “;” or tab

- Do not manually modify or copy values

More...

- No calculations
- No font colours
- No highlighting

Computer doesn’t recognize it!

Good vs Bad names

Good name	**God alternative**	**Bad name**
MaxTemp	max_temp	Maximum Temperature (C)
Quantity	Quantity_mg	Quamg
Sex		M/F
Weight	Weight_kg	w

Write protect

Mac:

- Right click on the file in Finder
- Select “Get Info”
- Sharing and permission
- Priviledge
- Read only

Write protect

Windows:

- Right click on the file in windows explorer
- Properties
- General tab
- Attributes
- Select the box for “read only”

Data Validation

Excel data validation feature

- Select a column
- In the menu bar, choose “Data”
- Validation

Integer or decimal number

Range

List of possible values

Limited length text

Be careful!

When identifiers are long integers

- 1000000 = 1e06

Do not fill blank cells with 0s

- 0s are data!

****SEPT2*** (Septin 2) → ‘2-Sep’

****MARCH1*** (Membrane-Associated Ring Finger (C3HC4) 1, E3 Ubiquitin Protein Ligase) → ‘1-Mar’

*Ziemann, Mark, Yotam Eren, and Assam El-Osta. "Gene name errors are widespread in the scientific literature." *Genome Biology* 17.1 (2016): 177.

Save

Always keep a copy of your data file in a **Plain TEXT Format**

- Tab delimited
- , or ; separated

Such as .csv or .txt

BACKUP and version control

- Git → workshop here at the CI
- Dropbox
- Google drive
- External hardrive
- ...

BACKUP

BACKUP

BACKUP

BACKUP

BACKUP

BACKUP!!!!!!!!!!

Practise 1

Practise 2