Statistical thinking in context

Melanie I Stefan

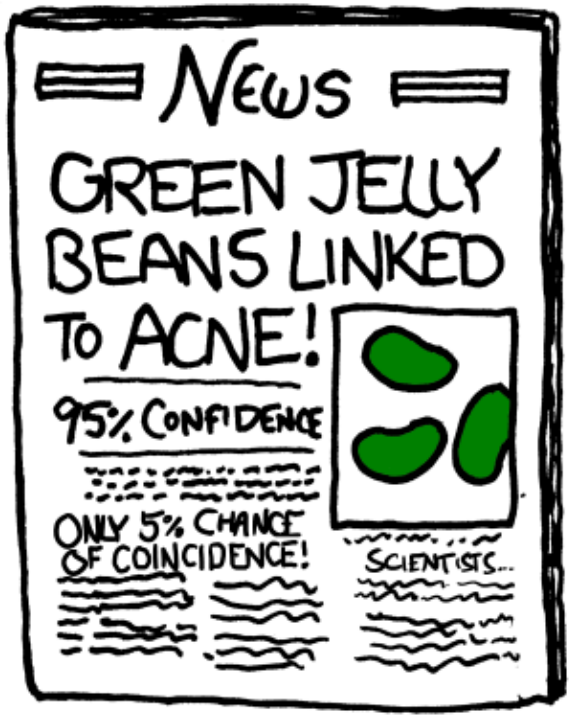
Centre for Integrative Physiology, University of Edinburgh

ASE 2016

Outline

Aims of this workshop

- Examine how statistical/ quantitative information is reported in the news
- Formalise the process of critically reading the news and forming an opinion
- Come up with guidelines that help students go through this process
- Jointly create a document that can be extended and tested in the classroom



R. Munroe, *Significant*, xkcd web comic, Apr. 2011

Outline

Who am I?

Neuroscientist interested in using computational tools to understand learning and memory
Interested in teaching statistics/quantitative methods to biologists

Edinburgh-Zhejiang Lecturer, since 2015
University of Edinburgh

Curriculum Fellow, 2013-2014
Harvard Medical School

Understanding the data analysis part of a scientific publication - The List

How to understand the data analysis part of a paper: A quick checklist for biology students

This guide is meant as a tool for biologists to help them understand the essence of the data analysis done in tpyical biology papers. Individuals can use it as a checklist by reading papers. It could also be used as a teaching tool, either as part of an introductory statistics class or as a short workshop, e.g. within a journal club. It might also come in handy for those writing a paper.

The dream is to have not just a list, but for every item, have a positive example and a negative example, or something else that would help someone decide whether that criterion has been reached.

This is a work in progress; suggestions and improvements are more than welcome! If you decide to pilot this within a class, please let me know about your experiences.

Experimental Design and Data collection

- [ ] What is the sample size? What did the authors do to convince you that is it large enough? (E.g. power analysis)
- [ ] What is the research question? What is the hypothesis? What is the corresponding Null Hypothesis?

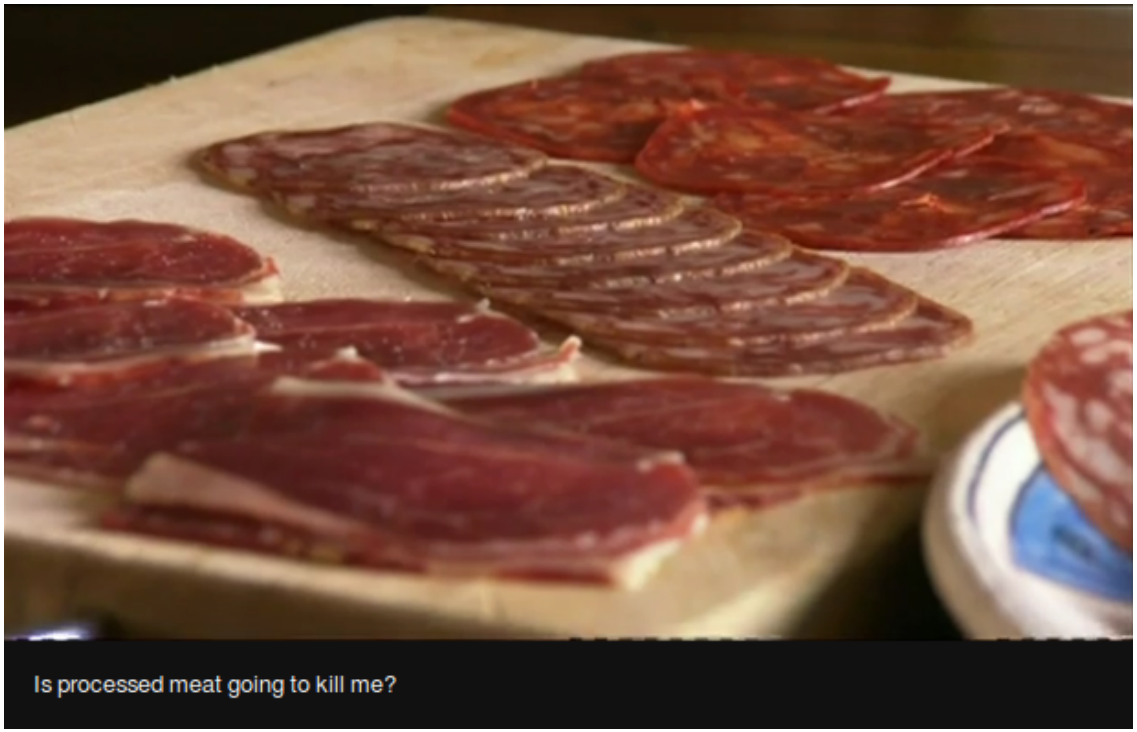
Understanding the data analysis part of a scientific publication - The Pilot

Understanding the data analysis part of a scientific publication - The Pilot

- Okinawa Collaborative International Undergraduate Workshop
- 20 students
- 1 afternoon session about data analysis and statistics
- Students used guiding questions to work through a scientific article

Outline

Bad news



J. Gallagher, *BBC News* (2015)

Good news

KLTV, *Study: Chocolate helps weight loss*, TV News Report, 2015

Outline

How to read a science news report

- Work in small groups ($\sim$ 20 minutes)
- Compile a list of questions that a reader should ask when reading a piece of science reporting in the news
- See if those questions can be organised into categories

R. Munroe, *Cells*, xkcd web comic, May 2013

Eggs

When it comes to breakfast, you can't beat eggs. (That was too easy, wasn't it?)
Seriously though, at a cost of only 72 calories, each large egg holds 6.3 grams of high-quality protein, along with a powerhouse punch of vital nutrients.
A study published in the International Journal of Obesity found that people who replaced carbs with eggs for breakfast lost as much as 65 percent more weight.
Research conducted in Michigan showed that regular egg eaters enjoyed more vitamins and minerals in their diets than those who ate few or no eggs. By examining surveys from more than 27,000 people, the researchers found that egg eaters were about half as likely to be deficient in vitamin B12, 24 percent less likely to be deficient in vitamin A, and 36 percent less likely to be deficient in vitamin E. [...]

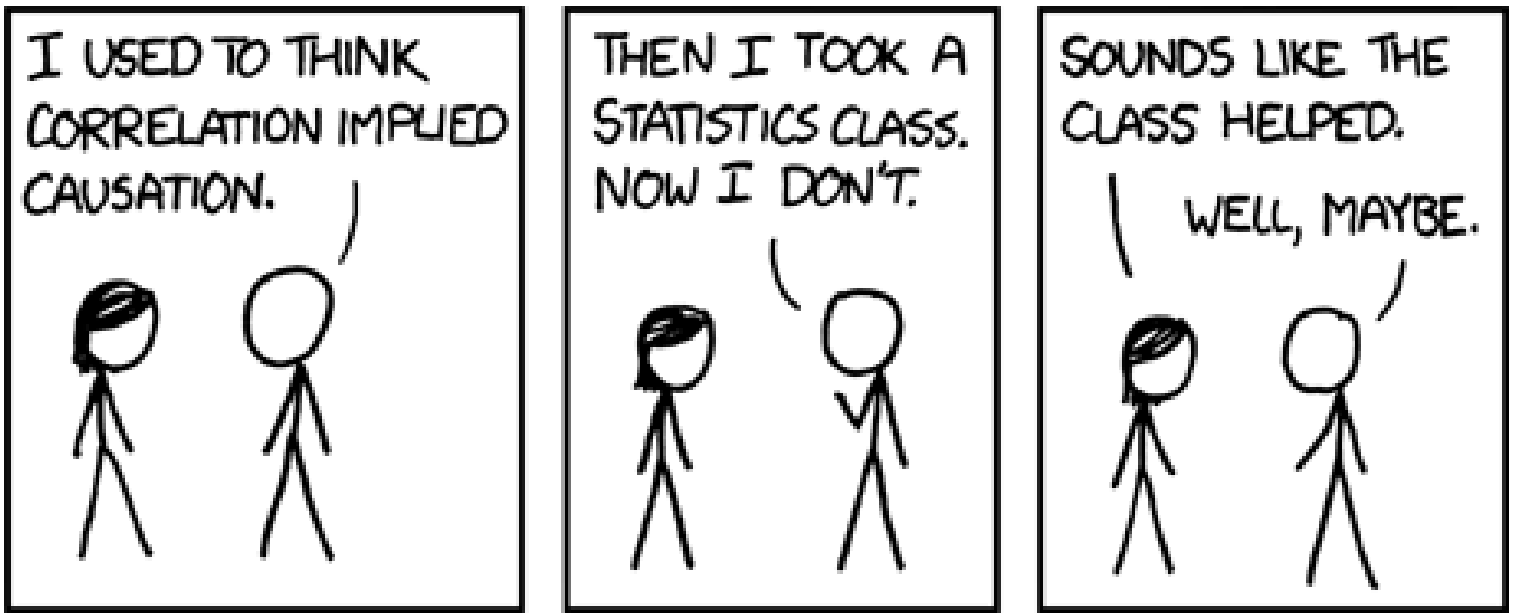
Runner's World, *10 Foods You Should Eat Everyday*, Online Article, Mar. 2012

Outline

What's next?

Please fill out the online evaluation (session code: T04)
`http://bit.ly/AC2016FF`

Interested in further developing this guide/testing it in your classroom?
Stay in touch: `mstefan@exseed.ed.ac.uk`



R. Munroe, *Correlation*, xkcd web comic, Mar. 2009