

Examples from newspapers

Assignment 4 contained the following question.

Find an article in a newspaper or magazine published in 2010 that gives the results of a survey, observational study or experiment. Cut out the article, which should be no bigger than half of an A4 page, and staple it to the top half of an A4 page. Write down the name of the newspaper or magazine, the page where the article appeared, and the date of publication.

In the second half of the page, comment briefly on the article. For example, does it describe a survey, an observational study or an experiment? If a survey, how was the sample chosen? If an observational study, what conditions were compared? If an experiment, what were the treatments and the experimental units? What was measured?

Do you think this investigation was conducted well?

When we think about data we have to think about its

collection What question were the data-collectors trying to answer? How did they collect the data? What did they measure or ask?

summary and display See the lectures on Exploratory Data Analysis, and also Minitab Practicals 3 and 7.

analysis This includes estimation and hypothesis testing. More advanced techniques are covered in later Statistics modules.

interpretation We have to explain our results in a non-technical way without losing precision.

The assignment question was about the *collection* phase. These notes contain a number of examples submitted in the assignment, to illustrate important points about data collection.

Although I took photocopies of the most instructive examples, I did not always record the newspaper, page and date. If you see that I have used your example without the full reference, please email me with the missing information.

A survey

Source *Daily Mail*, 6 February 2010, page 3.

Questions of interest How many UK households have cats and/or dogs?

Is this related to level of education or number of children?

Sample A phone survey based on census data.

How many? How were they chosen?

What exactly was asked? *This doesn't appear to be stated.*

Analysis $\mathbb{P}(\text{cat owner} \mid \text{has a degree})$ is 36% more than $\mathbb{P}(\text{cat owner} \mid \text{has no degree})$.

What exactly does this mean?

Let p_1 be the proportion of people with degrees who have cats, and let p_2 be the proportion of people without degrees who have cats.

Does it mean " $p_1 - p_2 = 0.36$ "? Or does it mean " $p_1 = 1.36p_2$ "?

Headline "Cat owners are cleverer."

They appear to be making the classic mistake about conditional probability.

They are claiming that

$$\mathbb{P}(\text{has a degree} \mid \text{cat owner}) > \mathbb{P}(\text{has a degree} \mid \text{dog owner}).$$

They need to tell us the numbers in all of the four boxes below before we can work out the conditional probabilities correctly.

	Has cat	No cat
Has a degree		
Does not have a degree		

A survey

Source *Metro*, 5 February 2010, page 13.

Question of interest How satisfied are rail passengers?

Is this really a surrogate for “How good are the train operating companies?”?

Sample The “independent watchdog Passenger Focus” surveyed 25,000 rail passengers.

How were they chosen?

What exactly was asked? *Something like “How satisfied are you with the journey / punctuality / reliability?” It seems that respondents were asked to tick a box on a scale*

... .. fairly very

Summary A table showing, for each train operating company, the percentage of respondents who were fairly or very satisfied.

An experiment

Source *Times*, no date given.

Question of interest Can a new type of chocolate improve the health of diabetic women?

Treatments $\left\{ \begin{array}{l} \text{new chocolate} \\ \text{normal chocolate} \end{array} \right.$

Why are they not including ‘no chocolate’?

Experimental units 150 women, post-menopause, with type-2 diabetes.

What will be measured? Plaque volume, artery thickness, etc.

An experiment—or maybe two

Source *Times*, 8 February 2010, referring to a scientific paper published in *The Lancet Oncology*.

Question of interest Can breast cancer patients benefit from fewer, larger doses of radiotherapy?

Treatments

	grays	portions	weeks
standard	50	25	5
A1	39	13	5
A2	41.6	13	5
B	40	15	3

Women in Trial A received treatment A1 or treatment A2. Women in Trial B received treatment B.

Hmmm... Was the standard treatment included in these trials? If not, how do they know that the decrease in side-effects is caused by the new treatments rather than the positive effect of knowing that you are in a trial?

Why were different treatments tested in different trials? Might there have been other differences between the trials (such as type of hospital, or racial background of the women)?

Experimental units 4451 patients

What was measured? Tumour recurrence, skin changes, side effects, ...

Analysis The new treatments are as effective as the standard, and have fewer side effects.

An observational study

Source *Daily Mail*, 8 February 2010, no page given;
also *Sun*, 8 February 2010, page 21.

Question of interest Do fizzy drinks increase the risk of pancreatic cancer?

Observational units 60500 people in Singapore for 14 years.

What was recorded? How many cans of fizzy drinks each person consumed per week (*did they ask people to record this in a diary, or to recall it from memory? and did they ask them every week, or for a sample of weeks, or just occasionally?*) and incidence of pancreatic cancer.

Analysis People who drink two or more cans of fizzy drinks per week have an 87% increase in the risk of getting pancreatic cancer compared to those who drink none.

An observational study using a census

Source *Metro*, 9 February 2010, no page given;
also another newspaper, page 8, citing a scientific paper published in *Autism Research*

Question of interest Are older mothers more likely to have autistic children?

Observational units All children born in California 1990–1999.

What was recorded? For all birth records in California from 1990–1999 inclusive, the age of the mother when she gave birth was recorded. They also recorded whether or not the child was autistic.

How did they find out which children were autistic? Diagnosis does not happen until a few years after birth. Did they trace children who had moved away from California?

Analysis The risk increases by 18% for every 5-year increase in the mother's age.

A survey??

Source A newspaper, February 2010.

Question of interest Do men know anything about their girlfriends?

Sample 2000 men buying scent for their female partner at The Perfume Shop.

Hmmm . . . not very random or very representative!

What exactly was asked? Ten questions like “What colour are her eyes?”, “What is her date of birth?”.

Or maybe just “Do you know what colour her eyes are?”, etc.

Analysis For each question, between 10% and 30% did not know the answer.

Headline Men are ignorant about their female partners.

Congratulations to the student who submitted this example and pointed out how silly it is. This is not a scientific survey at all; it is just a publicity stunt. Don't be taken in by this sort of nonsense.

The study may well tell us that men who buy perfume for their ladies do not know very much about them. If a man does know his girlfriend well then perhaps he knows that she prefers chocolate to perfume?

An experiment or an observational study?

Source *Daily Telegraph*, 5 February 2010, no page given, citing a scientific paper “to be published” in *Scandinavian Journal of Medicine and Science in Sports*.

Question of interest Is playing football better for health than running?

Treatments $\left\{ \begin{array}{l} \text{playing five-a-side football for an hour twice per week} \\ \text{running for an hour twice per week} \end{array} \right.$

Experimental units 47 men with high blood pressure.

What was measured? Blood pressure, weight, cholesterol,

What did they do? “. . . asked 47 men with high blood pressure to play football or run for an hour twice per week”.

Analysis The blood pressure of football players fell by twice as much as runners’.

Congratulations to the student who found this and pointed out that it is absolutely crucial to know what the phrase “asked 47 men to” means. Did they *allocate* each man to one of football and running? If so, it was an experiment. Or did they *let each man choose* between football and running? If so, it was an observational study.

I was sufficiently intrigued to hunt down further references to this. Every newspaper that I found that reported on it used the phrase “. . . asked 47 men with high blood pressure to play football or run for an hour twice per week”. This suggests that this wording was part of a statement to the press. If so, then either the person making the statement does not know the difference between an experiment and an observational study, or (s)he is deliberately fudging the difference. In neither case should we have much confidence in that person.

So I hunted some more, and located the paper “Positive performance and health effects of a football training program over 12 weeks can be maintained over a 1-year period with reduced training frequency”, by M. B. Randers, J. J. Nielsen, B. R. Krstrup, E. Sundstrup, M. D. Jakobsen, L. Nybo, J. Dvorak, J. Bangsbo and P. Krstrup, published in *Scandinavian Journal of Medicine and Science in Sports* in 2010. This seems to be the paper referred to by all the newspaper articles. In this paper, I could find no reference to any comparison between football and running. Of course, there may be something about it in one of the many papers cited by this one, but if we cannot find full details in a paper properly peer-reviewed and published in scientific journal then we should be sceptical about the trial.

There is more (or maybe I should say “less”.) If you are part of a five-a-side football team then you had better turn up, or you will let your mates down; and you will continue playing until the end of the match unless you are injured seriously enough to leave the pitch. If you are running along the towpath by yourself and you have a bad cold, you might decided to stop 20 minutes early. After all, it surely can’t make much difference and no one will know. Even worse, if your second run of the week is scheduled for the time when your Introduction to Statistics assignment is due in, and you haven’t finished the assignment yet, perhaps it won’t matter if you miss the run just this once? Did the study compare *actual running* with *actual football* or *supposed running* with *supposed football*?