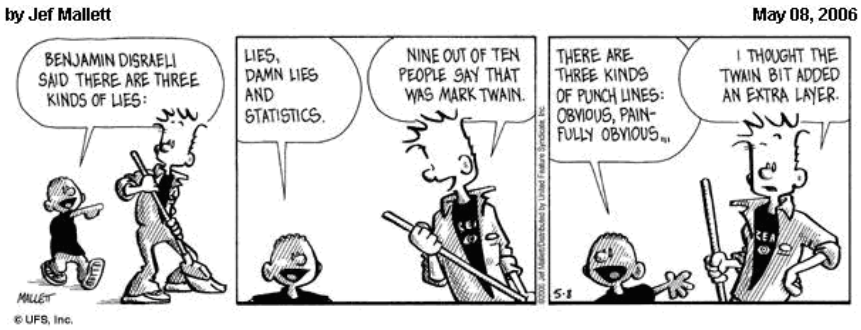
NCEA Level 2 Mathematics
19. Statistical Reports

Statistics is one of the most important tools in experimental science, and medicine. Even in the everyday world we are bombarded with statistics given to us by the media, politicians, and the internet. Because of this, being able to interpret statistics and judging whether or not they support a given argument, result, or point of view is an important skill in the modern world.



The statistical inquiry cycle is something you should already know about from as far back as intermediate school.

1. We begin with a question we want to answer, and perhaps a hypothesis backed up by some theory.
2. We decide what data we need to collect to answer our question.
3. We plan how we will collect our data, and how we will ensure it is accurate and precise.
4. We plan how we will process our data.
5. We collect our data. (This is intentionally *after* we plan how we will use it.)
6. We process our data in accordance with our plan.
7. We answer our question.
8. We decide how reliable our process was.
9. We write a report, detailing *all* of the above steps, such that another person could pick it up and try to replicate our findings.

Writing a question, and deciding on data to collect

A question should be written clearly and precisely, and there should be a straightforward way to answer it.

Some good questions:

- Are high school students in Wellington City more likely to cycle to school than students in Upper Hutt?
- Do male Y12 students tend to be taller than female Y12 students?
- Does this drug lower the risk of heart failure after a stroke?
- With what speed does a 0.5 kg weight hit the ground after being dropped 10 m?

Some bad questions (why?):

- Does this drug work?

- Will I crash if I drink and drive?
- Does the average person support the attempt by the USA to bring freedom and democracy to other places in the world?
- Any question you write after you've already collected your data!*

When you write your question, you should come up with a good idea as to what kind of data you will need to gather to answer it. This could be something like a set of measurements, or responses to a questionnaire, or something else.

Planning how to collect data

Sampling

Surveys

Questions

1.

*Try googling 'data dredging': "Data dredging (also data fishing, data snooping, data butchery, and p-hacking) is the misuse of data analysis to find patterns in data that can be presented as statistically significant when in fact there is no real underlying effect. This is done by performing many statistical tests on the data and only paying attention to those that come back with significant results, instead of stating a single hypothesis about an underlying effect before the analysis and then conducting a single test for it.

"The process of data dredging involves automatically testing huge numbers of hypotheses about a single data set by exhaustively searching—perhaps for combinations of variables that might show a correlation, and perhaps for groups of cases or observations that show differences in their mean or in their breakdown by some other variable." (Wikipedia contributors. (2019, January 13). Data dredging. In Wikipedia, The Free Encyclopedia. Retrieved 22:29, January 20, 2019, from `https://en.wikipedia.org/w/index.php?title=Data_dredging&oldid=878260765`)