

**Medical Statistics (MATH38071) Exercise Sheet 1
(Introduction)**

1. In studies investigating the effect of an exposure on health, what is the difference between observational and experimental studies? Give an example where it would not be ethical to conduct an experimental study in human subjects.

Answer

In an observational study the investigator observe subjects and measure variables of interest without assigning exposure to the subjects. The treatment that each subject receives is determined is not control of the investigator.

In an experimental study the investigators apply treatments to experimental units (people, animals, plots of land, etc.) and then proceed to observe the effect of the treatments on the experimental units.

An examples of where it would be unethical to conduct an experimental study examining the effect of an exposure are numerous and would apply to almost any exposure that is thought to have a detrimental effect on human health. For example it would be unethical to allocate people to smoke or not smoke to investigate the effects of smoking.

2. Consider a study investigating whether consumption of sugar causes heart disease. Suggest an example of each of the following types of variable
- (i) Exposure
 - (ii) Outcome
 - (iii) Intermediate
 - (iv) Confounding.

Answer

- (i) Daily sugar consumption determined from a dietary diary would be an exposure variable.
- (ii) There are many possible outcome measures. Examples include (i) clinical symptoms of heart disease (ii) the requirement of treatment for heart disease (iii) electro cardio graphic (ECG) measurements of heart function
- (iii) Blood sugar measurement as it would be presumed that consumption of sugar would raise blood sugar levels.
- (iv) Smoking or dietary fat intake are possible confounding variables as both might cause heart disease by a different mechanism but might correlate with dietary sugar intake.

3. Give one advantage and one disadvantage of using each of the following types of epidemiological study design to investigating whether sugar causes heart disease:

(i) A cases-control study.

Answer

An advantage of a case control is that it can be carried out retrospectively and so results can be obtained rapidly. Patients with heart disease could be identified and matched controls selected. The previous dietary intake of sugar could then be determined for the cases and the controls and the sugar consumption compared. Unfortunately this comparison could be biased as recall of consumption of sugar could differ between cases and controls, particularly if some of the cases perceive this as a possible cause of their heart disease.

(ii) A cohort study.

Answer

An advantage of a cohort study is that dietary intake of sugar could be determined prospectively and should therefore be less biased than retrospective determination. A major disadvantage is cost as one might have to wait for many years for cases of heart disease to develop in the cohort selected for the study.