

Problem 1:

- 1(a) It is a randomized experiment since it randomly chooses sample from the population.
- 1(b) The number of children contracted polio is the explanatory variable.
- 1(c) The effectiveness of a new Salk vaccine is the response variable.
- 1(d) Yes. The treatment group is the half received an injection of the Salk vaccine.
- 1(e) No. Both the (1) children who received the Salk vaccine and (2) children received injection of salt water should have the placebo effect. Therefore, difference in polio infections from the two groups should not be due to the Placebo effect.
- 1(f) This experiment is single-blind. The participants do not know which injection they receive while The experimenters do know which half of sample receive the Salk vaccine.

Problem 2:

- 2(a) It is an observation study. The size of sample is too small. They should identify more people.
- 2(b) It is an observation study. The period is too short. The patients should be asked a longer period.

Problem 3:

- 3(a) Question (i) can be performed through a randomized experiment. The experiment randomly selects sample runners from the population. Half of them are assigned to a treatment group that lifting weights every week and the other half are assigned to a control group that avoids lifting weights. After a sufficient long period, they are compared with the performance in a 10-kilometer race
- 3(b) It is neither double-blind nor single-blind. The participants are told that they should be whether lifting weights or not. The experimenters also know which half of sample should lifting weight.
- 3(c) Question (ii) can be performed as a retrospective study. The experiment randomly selects people from the population. All of them are asked to recall whether the seat belts save them or people they known. Finally, the result is concludes based on their answers.

Problem 4:

- 4(a) It is a simple random sampling since the magazine just send the total 100,000 surveys to its subscribers. Each subscriber is chosen randomly and entirely by chance.
- 4(b) The population is all women still married.
- 4(c) The sampling frame is the subscribers of magazine.

4(d)

1. The survey has low response rate. Copies of the survey were mailed to the magazine's 100,000 subscribers, but only 5,000 of them returned. The response rate is only 0.05%. It can give rise to sampling bias.
2. The survey is sampling from the wrong population. The subscribers might include women who are not married.
3. The survey is using a convenience sample. They were just mailed to the magazine's subscribers, while there are women married that they are not its subscribers.
4. The survey is using a voluntary response. The magazine used mail questionnaires, but only 0.05% of the recipients responded.

Problem 5:

5(a) (i) is a nominal variable. (ii) is a continuous variable.

5(b) (i): Natural variability across individuals. Each student's college cannot measure so there is no measurement error. Each student's college is distributed based on their initial choice and cannot change throughout academic career in CUHK.

(ii): Some combination of these 3 causes. For each student, it is different when measurement being done after exercise or not. It is also various between students who have regular exercise or not. Machine is required to measure it and every machine has measurement error.