MAP4C1 Unit 4: Statistical Literacy

4.2 Surveys and Questionnaires

Learning Goals: I am learning to…
- ☐ Identify and explain the different types of sampling techniques
- ☐ Identify and explain the different types of bias in surveys and questionnaires

Representative Sample: A sample that is typical of the entire population. If the sample is not representative, it is biased and the survey results are invalid.

Sample Size: In a survey, the sample size can affect results.
- If the sample is too small, the survey results may not be reliable.
- If the sample is too large, the survey may cost too much to complete and may to too difficult to conduct fairly.

Part A: Sampling Techniques

Random Techniques: Where each of the population has an equal chance of being selected.

1. Simple Random Sampling → Participants are picked randomly.
2. Stratified Sampling → The population is grouped, and a few individuals are picked from each group. e.g. 10 students from each grade at BHSS
3. Cluster Sampling → The population is organized into groups and one group is chosen e.g only 1 specific grade at BHSS
4. Systematic Sampling → Every n^{th} individual is selected. e.g. every 10th person

Non-Random Techniques: Will not necessarily provide a representative sample.

1. Convenience Sampling → Individuals who are easy to sample are chosen
2. Judgement Sampling → The person who is doing the sampling uses their judgement to create a representative sample.
3. Volunteer Sampling → Participants volunteer.

Example 1: A town has a population of 20,000 people. The town council conducts a vote at a public meeting about constructing a new ice-hockey rink.
- 50 people attend the meeting
- 40 of the people at the meeting are in favour of the new hockey rink
- The council decides to build the hockey rink since the majority of the people support the idea

a) What percent of the people at the meeting voted for the rink?

$\frac{40}{50} = 0.8\ (100\%)$ 80% voted yes. → only people at the meeting

b) What percent of people in the town attended the meeting?

$\frac{50}{20000} = 0.0025\ (100\%)$ 0.25% of the population

Good sample ≈10% of population

c) Is this sample representative? **Justify** your answer.
- The sample size was too small
- The sample technique was random → only those who chose to attend voted.

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Part B: Bias in Surveys

Bias: Occurs when the results of a survey do not reflect the entire population.

Biased Questions: These type of questions restrict people's choices or use words that could influence people to answer in a certain way. For results to be valid in a survey, questions must be unbiased

Types of Bias:

- **Leading Questions** → Contain wording or information to prompt a specific response
- **Loaded Question** → Suggest a socially desirable answer or are emotionally charged.
- **Response Bias** → When people intentionally lie or give false information.
- **Non-Response Bias** → When people fail to answer one or more questions.
- **Sampling Bias** → When you have a non-random sample.

Example 2: People walking by in the mall were asked "We harm the planet when we use pesticides on our lawns. Should the government ban all residential pesticide use?"

a) Will the survey results be valid? **Justify** your answer.

No, the question contains bias. The person starts the question with a leading question and also uses a loaded question to pressure you into answering in a specific way. → Also response bias.

b) How could this survey be improved?

Make the survey anonymous.
Remove the first sentance containing the leading/ loaded question.

Example 3: About 4000 people visited a large sports equipment store during its annual sale. The store surveyed 100 customers after they paid for their purchases. An employee recorded their answers.

1. Good sports equipment can greatly improve performance. How much do you spend on equipment each year?
   - ___ $200 or less
   - ___ $200–$400
   - ___ $400–$600
   - ___ $600–$800
   - ___ $800–$1000
   - ___ More than $1000
2. How much do you earn per year?
   - ___ Less than $10 000
   - ___ $10 000–$20 000
   - ___ $20 000–$40 000
   - ___ $40 000–$60 000
   - ___ $60 000–$80 000
   - ___ More than $80 000

a) Is this sample size large enough?

$\frac{100}{4000}(100\%) = 2.5\%$ → too small less than 10%.

b) Is this sample representative?

No, they only surveyed people who went to the store on the sale day & made a purchase.

c) Are the survey questions unbiased?

1) "Good sports equipment" is a loaded/leading question
2) very personal. There would be response and non-response bias.

d) Was the collection method appropriate?

No, they only surveyed people who made a purchase. The survey was not anonymous. People may feel pressured to participate.