

# Statistics 2

## CHAPTER 6 POPULATIONS AND SAMPLES

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A **population** is a collection of individuals or items. A population can be finite, infinite or countable infinite.

A **sample** is a selection of individual members of the population. Samples are used to help us make conclusions about the whole population.

**Sampling units** are the individual members of a selection of the population used for measurements. Together they form a sample of the population.

A **sampling frame** is a list of sampling units used in practice to represent the population. (in practice a sampling frame may not include all the sampling units in the population)

### 🔮 **Advantages and Disadvantages of Sampling**

#### **Advantages**

- When the sample is large and well mixed a good sample will be *representative* of the whole population
- *Cheaper and faster* than a census
- Quality of information may be better
- Advantageous when testing of selected items results in their destruction and checking every item in a population is uneconomical
- Using sampling data is generally more readily available and quickly analysed

#### **Disadvantages**

- Uncertainty due to:
  - ♦ *Natural variation*: differences among sampling units that cannot be controlled
  - ♦ *Bias*: bias is anything that prevents the sample from representing the population

#### **Bias occurs through:**

- Sampling from an incomplete sampling frame
- Personal subjective choice
- Non-response (response only from those who are interested in)
- Substituting convenient sampling units (when required units are not available and something else is chosen)

**Simple Random Sampling:** when every possible sample of size  $n$  has the same chance of being selected from  $N$  sampling units, with any other sample of size  $n$ .

A **statistic** is a quantity calculated solely from the observations in a sample.

A statistic has a **sampling distribution** that is defined by giving all possible values of the statistic and probability of each occurring.

In the cases where it is possible to take observations or measurements on every member of the population we say that we have taken a **census**.

### ● **Advantages and Disadvantages of Census**

#### **Advantages**

- every single member of the population is used
- it is unbiased
- it gives an accurate answer

#### **Disadvantages**

- it takes a long time to do
- it is costly
- it is often difficult to ensure that the whole population is surveyed

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**BOOK S2: Read pages 91 – 98**