Learning Objectives

- State main purposes of statistics.
- Understand place of biostatistics in larger field of statistics.
- Distinguish between populations and samples, including ability to enumerate members.
- Understand differences in nomenclature for characteristics of populations (parameters) and characteristics of samples (statistics).
- Distinguish between dichotomous, categorical (nominal), ordinal and continuous variables.

What is Biostatistics?

- Application of statistical principles to medical, public health and biological applications
  - Collecting, summarising, interpreting information and making inferences that appropriately account for uncertainty
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Issues for Biostatisticians

• Research question
• Study sample
• Sample size
• Analytic techniques
• Inferences – Cause/Effect
• Limitation

Sample vs. Population

• Any summary measure computed on a sample is a statistic
• Any summary measure computed on a population is a parameter

n = sample size
N = population size
Statistics & Parameters - nomenclature

- Parameters are represented by (1) Greek letters (µ,σ) or (2) capital letters (R).
- Statistics are represented by (2) lower case letters (m,s) or (2) by letters with a cap over them (R). The cap means estimate for the parameter, e.g., \( \hat{R} \) is the sample estimate for population parameter, R.
- Special case: mean of a sample: \( \bar{x} \)

Variable Types

- Discrete
- Continuous

  - Dichotomous
  - Nominal or Categorical
  - Ordinal

  - unordered discrete variables

  - ordered discrete variables

- Discrete – can take on only a limited number of values, e.g., ID numbers in a research study
- Continuous – can take on any value, e.g., body temperature – 98.62, 97.56

3 Levels:
1. Categorical or Nominal – unordered differences, e.g., zip codes, gender, eye color.
2. Ordinal – ordered differences, e.g., ratings of depression, attained education.

Summary: Variable Types

- Dichotomous variables have 2 possible responses, e.g., Yes/No, or present/absent in the case of an exposure or a disease.
- Ordinal and Categorical variables have more than two responses and responses are ordered and unordered, respectively.
- Continuous variables can assume in theory any values between a theoretical minimum and maximum.