introduction to bio-statistics

Research · July 2015

DOI: 10.13140/RG.2.1.4785.0085

CITATIONS
0

READS
7,984

1 author:

Sami Abdo radman Al-Dubai
Saudi Board of Preventive Medicine, Ministry of Health, KSA
134 PUBLICATIONS **3,168** CITATIONS

SEE PROFILE

INTERNATIONAL MEDICAL UNIVERSITY
MALAYSIA

Introduction to Biostatistics

DR SAMI ABDO RADMAN
COMMUNITY MEDICINE
IMU

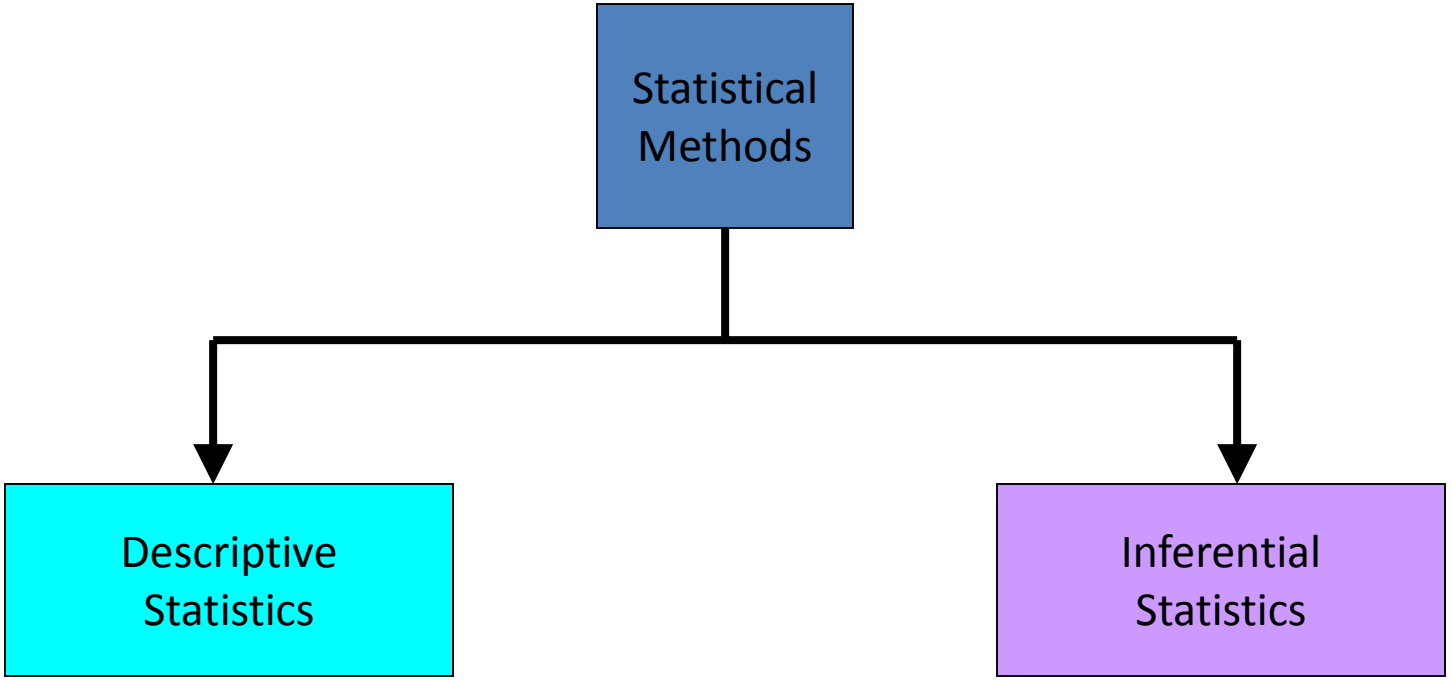
Definition

- Statistics is a science that deals with the collection, organization, analysis, interpretation and presentation of information that can be stated numerically.
- The science of drawing conclusions from data
- The analysis & interpretation of data to evaluate reliability of the conclusions based on the data
- The scientific describing of natural variation. Etc,

Why need to learn biostatistics?

- Essential for scientific method of investigation
  - Formulate hypothesis
  - Design study to:
  - objectively test hypothesis
  - Collect reliable and unbiased data
  - Process and evaluate data rigorously
  - Interpret and draw appropriate conclusions
- Essential for understanding, appraisal and critique of scientific literature

Types of Statistical Methods

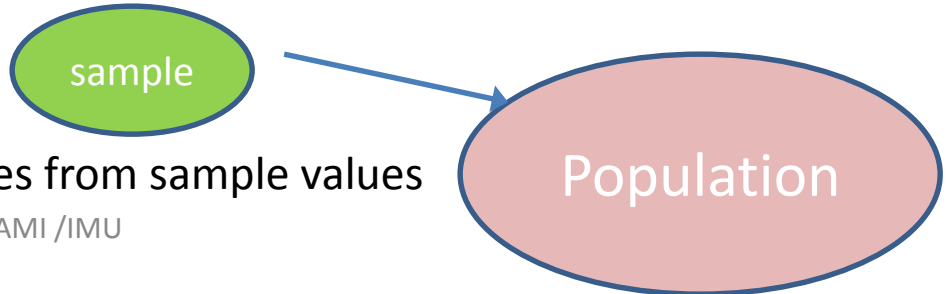


Types of statistical methods

- **Descriptive Statistics**
  - identify patterns
  - leads to *hypothesis generating*
- **Inferential Statistics**
  - distinguish true differences from random variation
  - allows *hypothesis testing*
  - Estimating population values from sample values

Types of statistical methods

- Descriptive statistical methods
  - Describe the data (including mean, median, mode, sd etc).
  - Used to summarize, organize and simplify data.
- Inferential statistical methods
  - A procedure for making inferences or generalizations about a larger population from a sample of that population.

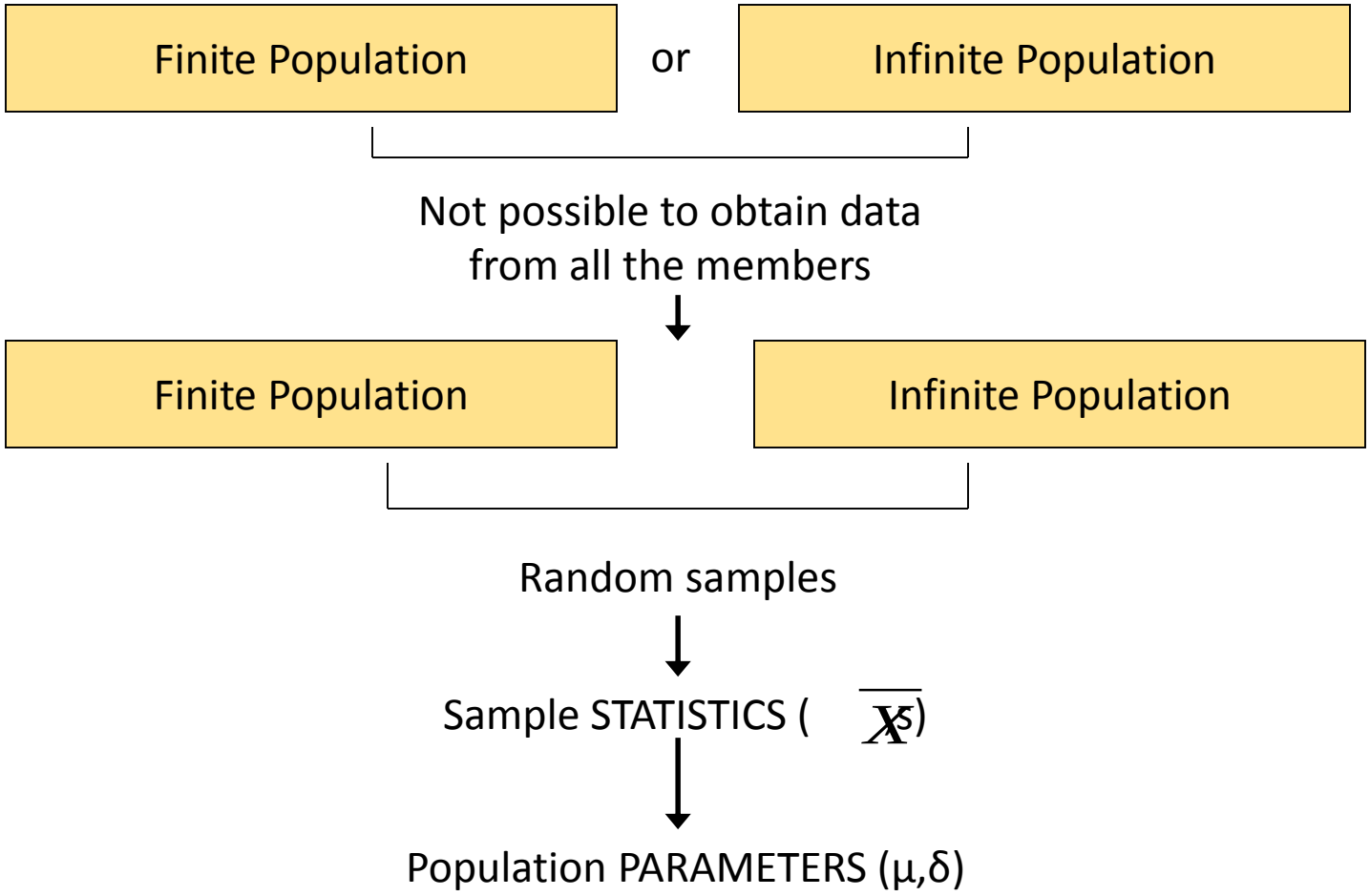


Estimating population values from sample values

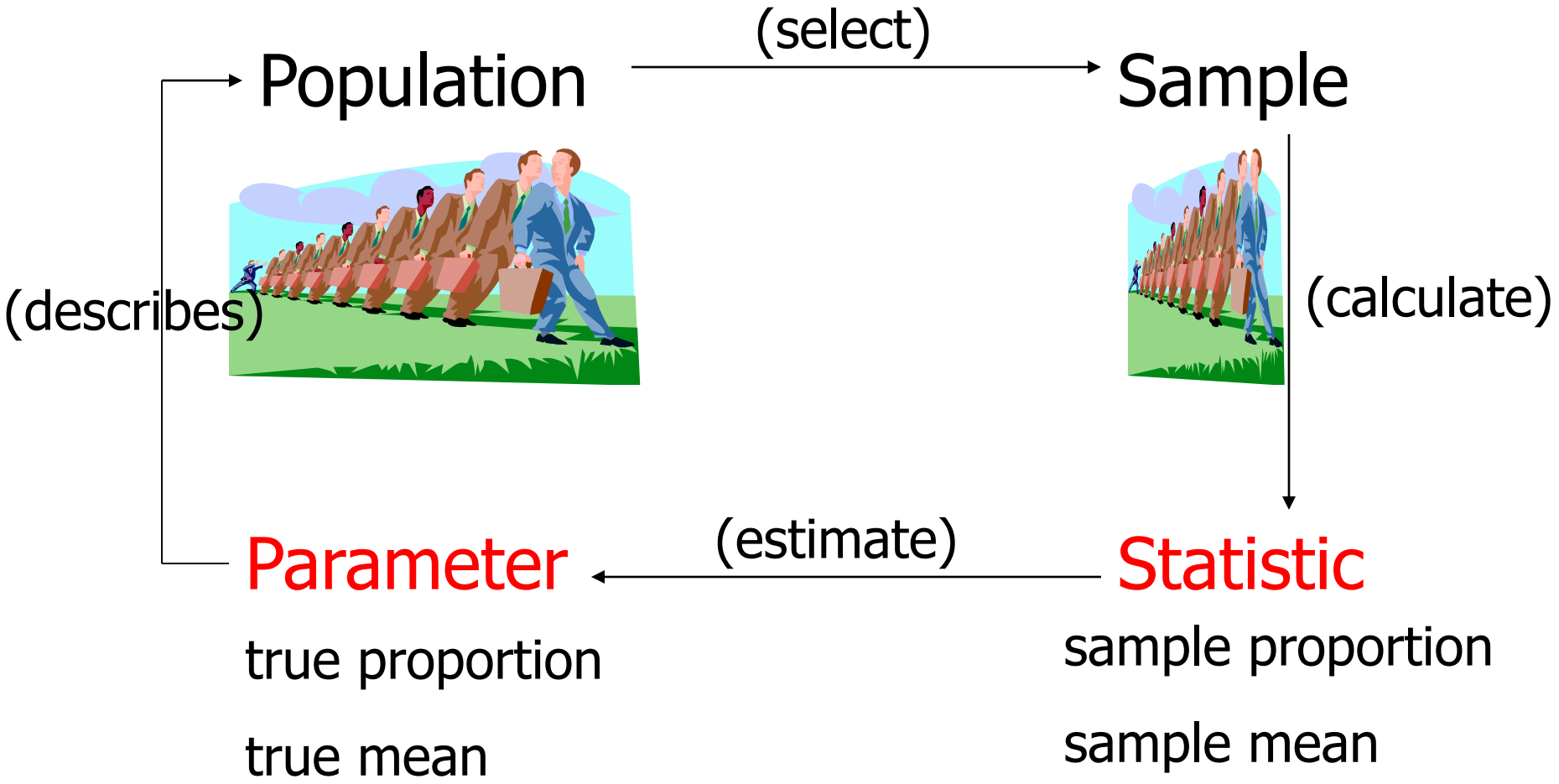
Descriptive Statistics

- Organization and summarization of data
- It includes:
  - Ways of ordering
  - Grouping data into distribution
  - Ways of calculating single numbers that summarise the whole data set
  - Ways of presenting data graphically and in tabulation form

Samples to Populations



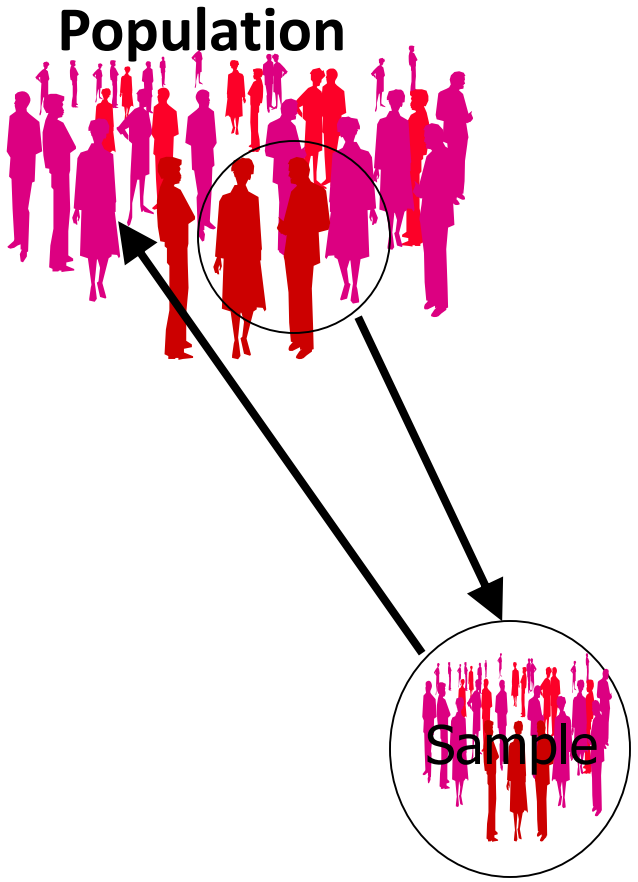
Statistic and Parameter



Inferential Statistics

- Two ways to generalize from samples to populations
  - **Estimation of parameters (Confidence Interval, CI)**
  - **Hypothesis testing (Test of significance, p value)**

- Purpose
  - Make decisions about population characteristics



Population Parameter vs Sample Statistic

➢ **Population Parameter**

- Is a number describing the population.
  - Example: μ, σ
- It is a fixed number.
- Usually we do not know their values.

➢ **Sample Statistic**

- Is a number describing the sample data.
  - Example: $\overline{X}$, s
- The value varies from sample to sample (sampling variation).
- Use observed result to get information about the population parameter.

Population and samples

Symbols	Population parameter	Sample statistic
Mean	μ	$\overline{X}$
Standard Deviation	σ	s
Variance	σ^2	s^2
Proportion	p	P
Product-moment correlation	r	ρ
Rank-order correlation	r_s	ρ_s
Size	N	n

Population Versus *Sample*

- We don't know the population mean μ but would like to know it
- We draw a sample from the population
- We calculate the sample mean $\overline{X}$
- How close is $\overline{X}$ to μ?
- Statistical theory will tell us how close $\overline{X}$ is to μ
- *Statistical inference* is the process of trying to draw conclusions about the population from the sample

STATISTICAL PROCESS

- Collection of Data
- Presentation of Data
- Data Analysis
- Interpretation

Statistical basic terms

- **Population**

  A collection or set of individual , objects or events whose properties are to be analyzed.

  Not only individuals , it could be any thing

- **Sample**

  a subset of a population selected by the collector.

Statistical basic terms

- The *population* of interest could be:
  - All women between ages 30–40
  - All patients with a particular disease
- The *sample* is a small number of individuals from the population
  - The sample is a subset of the population

Statistical basic terms

- A **variable** is a characteristic measured on individuals drawn from a population under study. age, gender, height, weight…….
- **Data** are measurements of one or more variables made on a collection of individuals
- Data (singular):

  The value of the variable of one element of the individuals e.g Saiful age = 22
- Data (plural): a set of values from the elements of the individuals age = 22, 23, 25, 21,…..

Statistical basic terms

- **Statistic**

  A numerical value summarizing the sample data eg mean $\overline{x}$

- **Parameter**

  A numerical value summarizing all the data of an entire population example mean μ

Types of Data

There are different statistical methods for different types of data

Types of Data

- Numerical (quantitative)
  - » Continuous
  - » Discrete
- Nominal (Qualitative)
  - » Binary (*dichotomous)*
  - » Categorical
  - » Ordinal (have an intrinsic order)

Types of Data

- Numerical (quantitative)
  - » Continuous (AGE, height, blood pressure,)
  - » Discrete (number of brothers/sisters)

- The variables ‘age’ and ‘number of brothers/sisters’ are examples of quantitative variables
- The variable ‘number of brothers/sisters’ takes integral values only; numbers such as 2.6 or 4.5 cannot occur. It is Discrete.
- A *continuous variable (*age) *,* on the other hand, can take any value.
- Examples of continuous variables are ‘birth weight’, ‘age’, ‘time’ and ‘body temperature’,
- Examples of discrete variables are ‘number of children per family’, ‘number of hospital admissions’

Types of Data

- Nominal
  - » Binary (*dichotomous) eg*
  - » Categorical
  - » Ordinal

Binary (*dichotomous) eg*

- Yes/No
- Polio: Yes/No
- Cure: Yes/No
- Gender: Male/Female

Types of Data

- Categorical DATA
  - Race/ethnicity
  - Country of birth

- Ordinal (have an intrinsic order)
  - social class 1 is ‘higher’ than social class 6
  - Course grade A, A-, B, B-, C,…….

- Dependent variable (outcome)

Eg. Blood pressure

- Independent variable

Eg. Age

Thank you