

Biostatistics and vital statistics

Dr. Md. Rahul Parvez
Lecturer, Community Medicine
Rajshahi Medical College

Statistics

- Statistics means **subject** when it is **plural in form and singular in use**. It is the branch of science that deals with methods and techniques of collection, processing, analysis and interpretation of data.
- Statistics means **data** when it is **plural in form and plural in use**. Data are the outcome measurement on certain characteristics that are generated from variables.
- Statistic** means **sample-based summary measure** when it is **singular in form and singular in use**. Any summary measure computed from a sample of data is called **statistic**.

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Functions of Statistics

- Data **collection**
- Data **reduction and summarization**
- Data **presentation** and
- Data **analysis and interpretation**

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Variable

- Any characteristic or measurement that is **able to vary** from individual to individual over time and place.
- Simply, **Variable = vary + able**
- Types of variable:**
 - Based on characteristics (At data collection/measurement stage):**
 - Qualitative variable** : Outcomes are not numerical and stated in narrative form. E.g. Sex: male/female
 - Quantitative variable** : Outcomes are measured numerically. E.g. weight in kilogram, height in meter etc.

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Variable

contd.

- **Quantitative variable:** It is again classified into 2 types:
 - i. **Discrete variable:** Outcome is only integer (1, 2, 3.....). E.g. Number of child: 1,2,3...
 - ii. **Continuous variable:** Outcome is real number i.e. both integer and rational number ($\frac{1}{2}$ or 0.5, $\frac{2}{3}$ or 0.667, 2, 3.....). E.g. height 5.7 inch, 5.8 inch, 5,9 inch...

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Variable

contd.

• Types of variable:

Based on causal relationship (At data analysis stage):

- i. **Dependent variable**
- ii. **Independent variable**
- iii. **Confounding variable**
- iv. **Intervening variable**

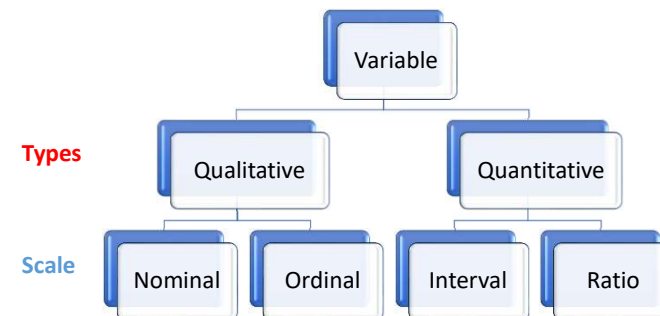
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Scale of measurement

- There are **4 scale** of measurements:
 - i. **Nominal scale:** Indicates name only e.g. male or female
 - ii. **Ordinal scale:** Indicates name as well as order e.g. level of education
 - iii. **Interval scale:** Zero (0) doesn't mean absence of characteristics e.g. 0°C temperature
 - iv. **Ratio scale:** Zero (0) means absence of characteristics

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Variable vs scale of measurement



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Data source

- A **set of values or information** about a variable that is measured or recorded on study subjects is called data.
- There are **3 sources** of data:
 - Primary source:** Surveys, experiments etc.
 - Secondary source:** Hospital records, journals, books etc.
 - Tertiary source:** Encyclopedia, bibliography etc.

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Data collection methods

- **Quantitative data** collection methods include-
 - ✓ Using available information
 - ✓ Face-to-face interview
 - ✓ Observation
 - ✓ Mailed questionnaire
 - ✓ Telephone interview
 - ✓ Self-administered questionnaire
 - ✓ Record review

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Data collection methods

- **Qualitative data** collection methods include-
 - ✓ Focus group discussion (FGD)
 - ✓ In-depth interview (IDI)
 - ✓ Key informants interview (KII)
 - ✓ Observation
 - ✓ Tape-record interview
 - ✓ Video record

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Data collection instruments/tools

- Data collection instruments are any kind of **forms or formats** that are used by researchers to actually collect data in research process.
- It can also be defined as an **electronic substrate, tool or instrument** used to record, transcribe or collect clinical data.
- These are **tools/devices** by which data are collected.
- It varies with the data collection methods used.

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Data collection instruments/tools

- Data collection instruments /tools are:
 - ✓ Questionnaire
 - ✓ Checklist
 - ✓ Interview schedule
 - ✓ Key informants' interview guide
 - ✓ In-depth interview guide
 - ✓ Camera
 - ✓ Microscope
 - ✓ Pen, paper etc.

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Data presentation technique/method

- Data can be presented in **three techniques/methods**:
 - Textual method/narrative method
 - Tabular method
 - Graphical method

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Parts/components of a table

- Table number
- Title
- Head note
- Caption (Column heading)
- Stub (Row heading)
- Body
- Source note
- Footnote

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Table Number:
 Title:
 (Head Note, if any)

Stub (Row Heading)	Caption (Column Heading)				Total (Rows)
	Sub-head		Sub-head		
	Column-head	Column-head	Column-head	Column-head	
Stub Entries (Row Entries)					
.					
Total Columns					

Source Note:
Footnote:

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Table 1: NCD risk factors among Bangladeshi adults (In percentage)

Risk factors	Male	Female
Inadequate fruits and vegetable intake	96.7	95.7
Insufficient physical activity	14.6	23.9
Tobacco consumption	54.7	25.4
Alcohol consumption	1.1	0.1
Overweight	22.5	34.9
Hypertension*	24.1	23.0

* including those who were in medication

Source: Bangladesh national STEPS survey report 2022

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Tabular presentation of data

• Types of table used in statistics:

1. Master table
2. Frequency table/frequency distribution table
3. Contingency table
 - i. Univariate table
 - ii. Bivariate table
 - iii. Multivariate table

} Cross table

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Frequency distribution table

Table 1. Frequency distribution table showing age of the respondents

Age category	Frequency	Cumulative frequency
21-25	5	5
26-30	7	12
31-35	6	18
36-40	9	27
41-45	3	30

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Univariate table

Table 2. Number of patient admitted in RMCH with bronchitis

Clinical stages of bronchitis	Number of patient admitted
Mild	
Moderate	
Severe	

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Bivariate table

Table 3. Bivariate cross table

Exposure (Smoking)	Outcome (COPD)	
	Yes	No
Yes		
No		

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Multivariate table

Table 4. Multivariate cross table

Smoking	Lung cancer			
	Yes		No	
	Male	Female	Male	Female
Yes				
No				

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Graphical presentation of data

For quantitative data

- i. Histogram
- ii. Frequency polygon
- iii. Frequency curve
- iv. Ogive curve
- v. Line chart
- vi. Stem and leaf

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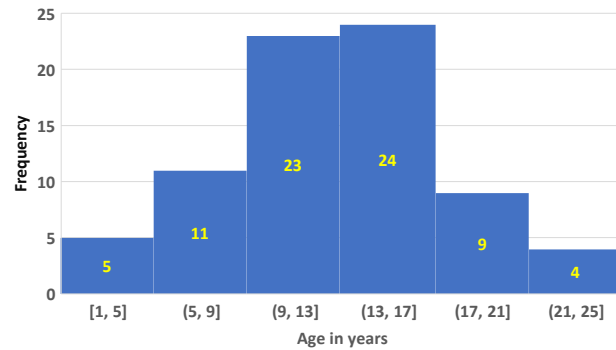
Graphical presentation of data

For qualitative data

- i. Simple bar diagram
- ii. Multiple bar diagram
- iii. Component bar diagram
- iv. Pie diagram
- v. Pictogram
- vi. Spot map

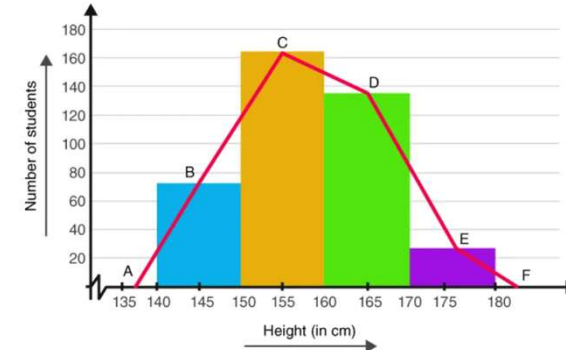
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Histogram



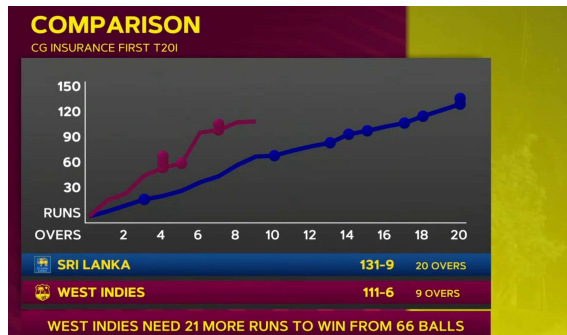
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Frequency polygon



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Ogive curve



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Stem and leaf

Example:
The data set shows the ages, in years, of people working in an educational technology office.

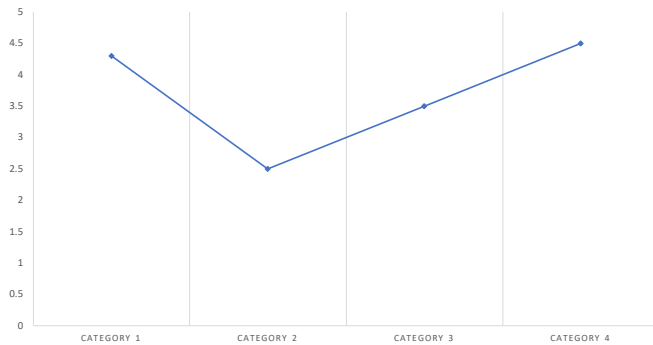
19, 52, 49, 48, 49, 18, 27, 31, 32, 58, 23, 34, 34, 25, 34, 47, 35

1	8, 9
2	3, 5, 7
3	1, 2, 4, 4, 4, 5
4	7, 8, 9, 9
5	2, 8

Key
1 | 8 = 18

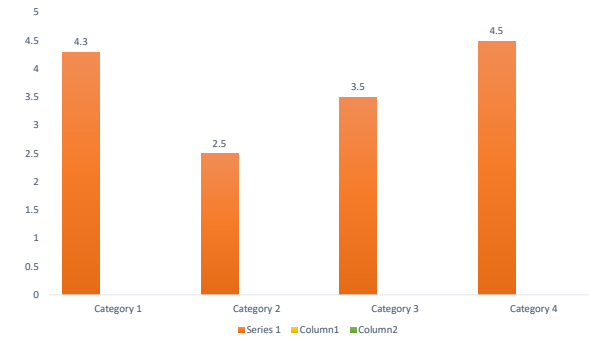
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Line chart



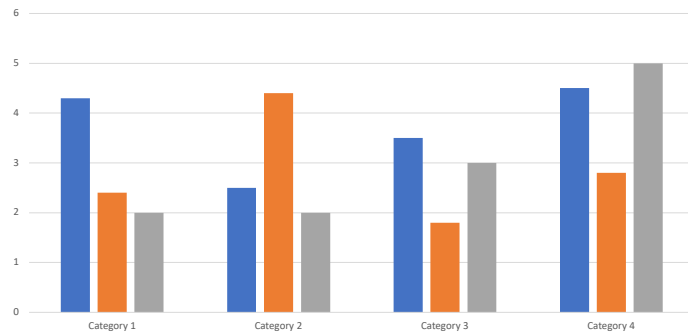
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Simple bar diagram



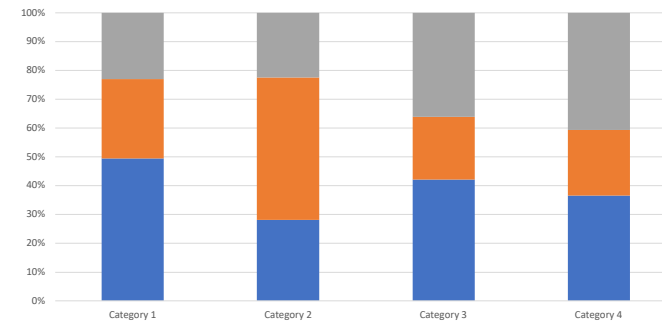
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Multiple bar diagram



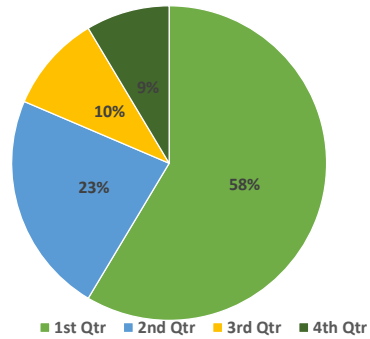
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Component bar diagram



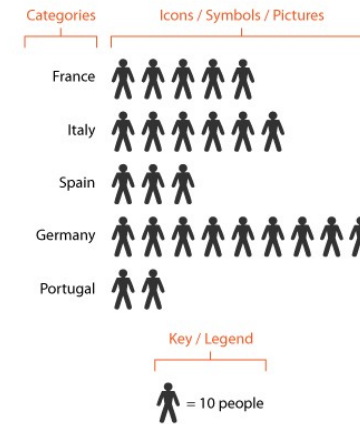
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Pie diagram



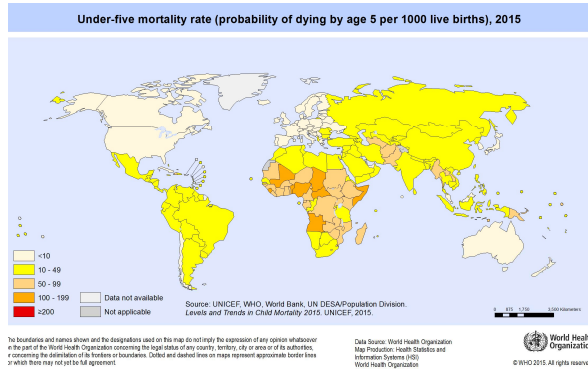
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Pictogram



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Spot map



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References

- abc of research methodology & biostatistics by Prof. Md. Mozammel Haque
- Fundamentals of biostatistics by Prof. M.A. Hafez
- Research methodology by Prof. Dr. Md. Ziaul Islam PhD

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