Tabular & Graphical Presentation of data

Dr. Shaik Shaffi Ahamed

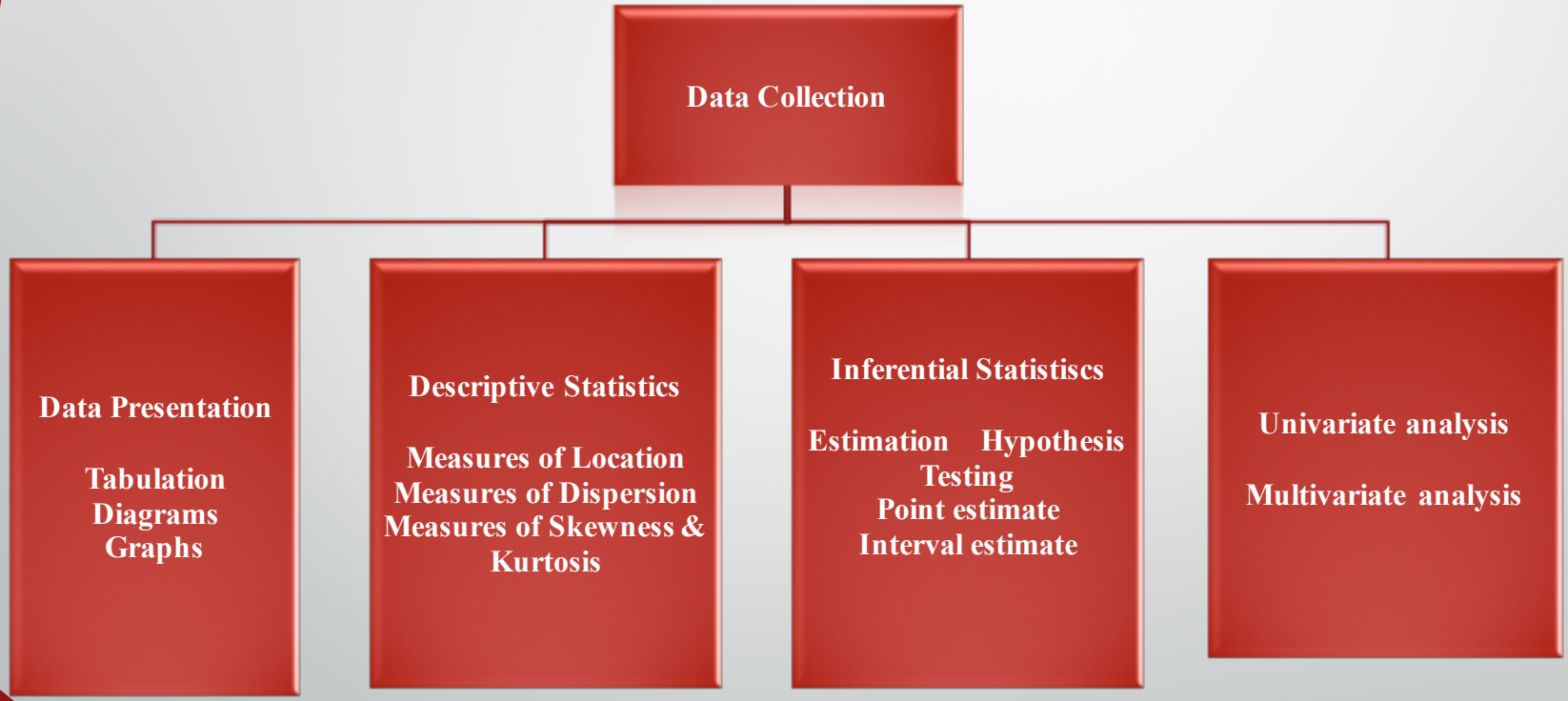
Associate Professor

Department of Family & Community Medicine

Objectives of this session

- To know how to make frequency distributions and its importance
- To know different terminology in frequency distribution table
- To learn different graphs/diagrams for graphical presentation of data.

Investigation



Frequency Distributions

"*A Picture is Worth a Thousand Words*"

Frequency Distributions

- Data distribution – pattern of variability.
  - The center of a distribution
  - The ranges
  - The shapes
- Simple frequency distributions
- Grouped frequency distributions

Simple Frequency Distribution

- The number of times that score occurs
- Make a table with highest score at top and decreasing for every possible whole number
- N (total number of scores) always equals the sum of the frequency
  - $\Sigma f = N$

Categorical or Qualitative Frequency Distributions

- What is a categorical frequency distribution?

  A categorical frequency distribution represents data that can be placed in specific categories, such as gender, blood group, & hair color, etc.

Categorical or Qualitative Frequency Distributions -- Example

Example: The blood types of 25 blood donors are given below. Summarize the data using a frequency distribution.

AB	B	A	O	B
O	B	O	A	O
B	O	B	B	B
A	O	AB	AB	O
A	B	AB	O	A

Categorical Frequency Distribution for the Blood Types -- *Example Continued*

Class (Blood Type)	Frequency, f
A	5
B	8
O	8
AB	4
Total	n = 25

Note: The classes for the distribution are the blood types.

Quantitative Frequency Distributions -- Ungrouped

- What is an ungrouped frequency distribution?

  An ungrouped frequency distribution simply lists the data values with the corresponding frequency counts with which each value occurs.

Quantitative Frequency Distributions – Ungrouped -- *Example*

- Example: The at-rest pulse rate for 16 athletes at a meet were 57, 57, 56, 57, 58, 56, 54, 64, 53, 54, 54, 55, 57, 55, 60, and 58. Summarize the information with an ungrouped frequency distribution.

Quantitative Frequency Distributions – Ungrouped -- *Example Continued*

Class (pulse Rate)	Frequency, f
53	1
54	3
55	2
56	2
57	4
58	2
60	1
64	1
Total	n = 16

Note: The (ungrouped) classes are the observed values themselves.

Example of a simple frequency distribution (ungrouped)

- 5 7 8 1 5 9 3 4 2 2 3 4 9 7 1 4 5 6 8 9 4 3 5 2 1 (No. of children in 25 families)

	f
9	3
8	2
7	2
6	1
5	4
4	4
3	3
2	3
1	3

$\sum f = 25$ *(No. of families)*

Relative Frequency Distribution

- Proportion of the total N
- Divide the frequency of each score by N
- Rel. $f = f/\mathrm{N}$
- Sum of relative frequencies should equal 1.0
- Gives us a frame of reference

Relative Frequency Distribution

Class (pulse Rate)	Frequency, f	Relative Frequency
53	1	0.0625
54	3	0.1875
55	2	0.1250
56	2	0.1250
57	4	0.2500
58	2	0.1250
60	1	0.0625
64	1	0.0625
Total	n = 16	1.0000

Note: The relative frequency for a class is obtained by computing f/n.

Example of a simple frequency distribution

- 5 7 8 1 5 9 3 4 2 2 3 4 9 7 1 4 5 6 8 9 4 3 5 2 1

	f	*rel f*
9	3	.12
8	2	.08
7	2	.08
6	1	.04
5	4	.16
4	4	.16
3	3	.12
2	3	.12
1	3	.12
	$\sum f = 25$	$\sum \text{rel } f = 1.0$

Cumulative Frequency Distributions

- *cf = cumulative frequency: number of scores at or below a particular score*
- A score's standing relative to other scores
- Count from lower scores and add the simple frequencies for all scores below that score

Example of a simple frequency distribution

- 5 7 8 1 5 9 3 4 2 2 3 4 9 7 1 4 5 6 8 9 4 3 5 2 1

	f	*rel f*	*cf*
9	3	.12	3
8	2	.08	5
7	2	.08	7
6	1	.04	8
5	4	.16	12
4	4	.16	16
3	3	.12	19
2	3	.12	22
1	3	.12	25

$\sum f = 25$ $\sum \text{rel } f = 1.0$

Example of a simple frequency distribution (ungrouped)

- 5 7 8 1 5 9 3 4 2 2 3 4 9 7 1 4 5 6 8 9 4 3 5 2 1

	f	*cf*	*rel f*	*rel. cf*
9	3	3	.12	.12
8	2	5	.08	.20
7	2	7	.08	.28
6	1	8	.04	.32
5	4	12	.16	.48
4	4	16	.16	.64
3	3	19	.12	.76
2	3	22	.12	.88
1	3	25	.12	1.0
	$\sum f = 25$		$\sum \text{rel } f = 1.0$	

Quantitative Frequency Distributions -- Grouped

- What is a grouped frequency distribution? A grouped frequency distribution is obtained by constructing classes (or intervals) for the data, and then listing the corresponding number of values (frequency counts) in each interval.

Tabulate the hemoglobin values of 30 adult male patients listed below

Patient No	Hb (g/dl)	Patient No	Hb (g/dl)	Patient No	Hb (g/dl)
1	12.0	11	11.2	21	14.9
2	11.9	12	13.6	22	12.2
3	11.5	13	10.8	23	12.2
4	14.2	14	12.3	24	11.4
5	12.3	15	12.3	25	10.7
6	13.0	16	15.7	26	12.5
7	10.5	17	12.6	27	11.8
8	12.8	18	9.1	28	15.1
9	13.2	19	12.9	29	13.4
10	11.2	20	14.6	30	13.1

Steps for making a table

Step1 Find Minimum (9.1) & Maximum (15.7)

Step 2 Calculate difference 15.7 – 9.1 = 6.6

Step 3 Decide the number and width of the classes (7 c.l) 9.0 -9.9, 10.0-10.9,----

Step 4 Prepare dummy table –

Hb (g/dl), Tally mark, No. patients

DUMMY TABLE

Hb (g/dl)	Tall marks	No. patients
9.0 – 9.9 **10.0 – 10.9** **11.0 – 11.9** **12.0 – 12.9** **13.0 – 13.9** **14.0 – 14.9** **15.0 – 15.9**		
Total		

Tall Marks TABLE

Hb (g/dl)	Tall marks	No. patients
9.0 – 9.9	I	1
10.0 – 10.9	III	3
11.0 – 11.9	IIII I	6
12.0 – 12.9	~~IIII IIII~~	10
13.0 – 13.9	~~IIII~~ IIII	5
14.0 – 14.9	III	3
15.0 – 15.9	II	2
Total	-	30

Table Frequency distribution of 30 adult male patients by Hb

Hb (g/dl)	No. of patients
9.0 – 9.9	1
10.0 – 10.9	3
11.0 – 11.9	6
12.0 – 12.9	10
13.0 – 13.9	5
14.0 – 14.9	3
15.0 – 15.9	2
Total	30

Table Frequency distribution of adult patients by Hb and gender

Hb (g/dl)	Gender		Total
	Male	Female	
<9.0	0	2	2
9.0 – 9.9	1	3	4
10.0 – 10.9	3	5	8
11.0 – 11.9	6	8	14
12.0 – 12.9	10	6	16
13.0 – 13.9	5	4	9
14.0 – 14.9	3	2	5
15.0 – 15.9	2	0	2
Total	30	30	60

Elements of a Table

Ideal table should have

Number
Title
Column headings
Foot-notes

Number - Table number for identification in a report

Title, place - Describe the body of the table, variables,
Time period (What, how classified, where and when)

Column - Variable name, No. , Percentages (%), etc.,
Heading

Foot-note(s) - to describe some column/row headings, special cells, source, etc.,

DIAGRAMS/GRAPHS

Qualitative data (Nominal & Ordinal)

--- Bar charts (one or two groups)

--- Pie charts

Quantitative data (discrete & continuous)

--- Histogram

--- Frequency polygon (curve)

--- Stem-and –leaf plot

--- Box-and-whisker plot

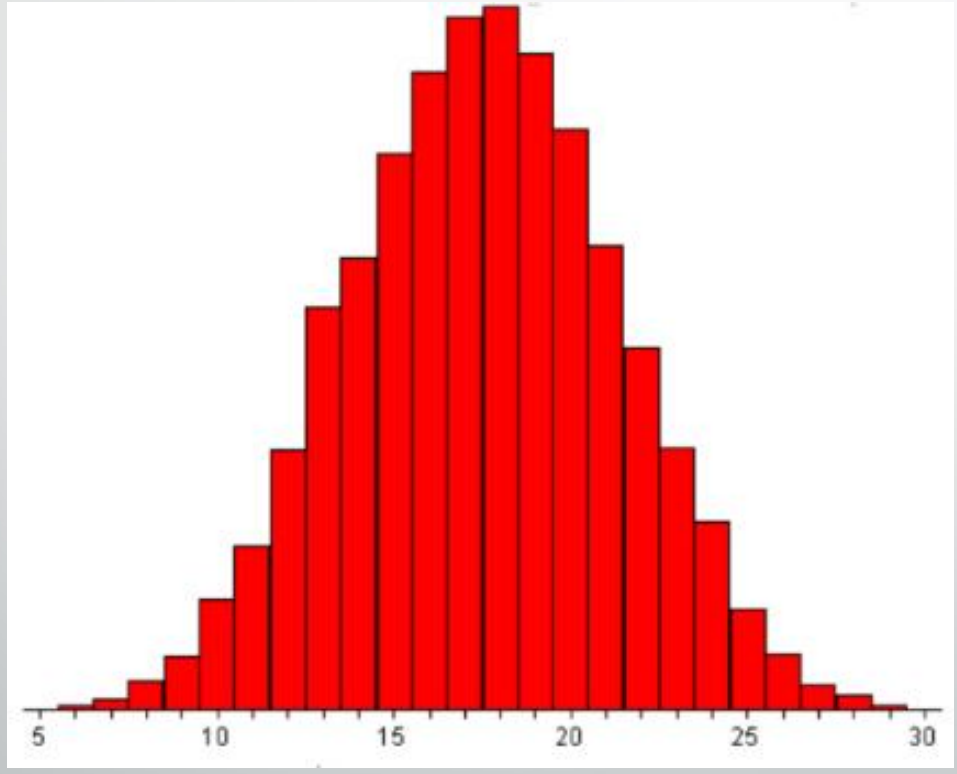
--- Scatter diagram

Example data

68	63	42	27	30	36	28	32
79	27	22	28	24	25	44	65
43	25	74	51	36	42	28	31
28	25	45	12	57	51	12	32
49	38	42	27	31	50	38	21
16	24	64	47	23	22	43	27
49	28	23	19	11	52	46	31
30	43	49	12				

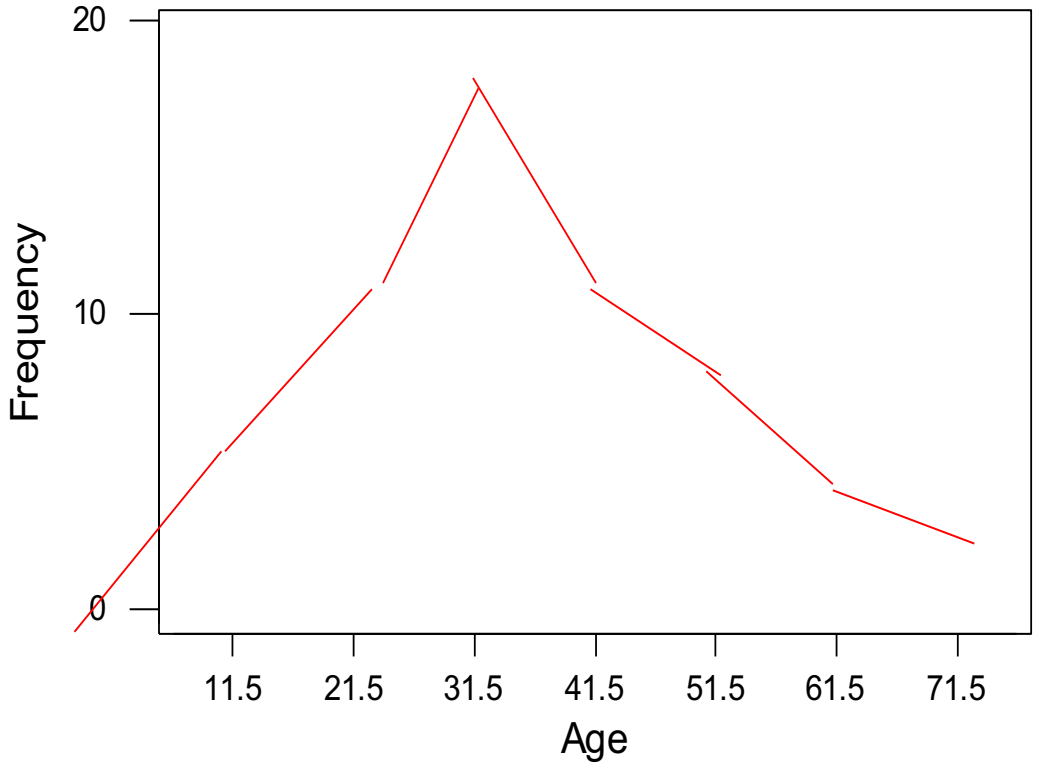
Histogram

Continuous Data



No segmentation of data into groups

Polygon



Example data

68	63	42	27	30	36	28	32
79	27	22	28	24	25	44	65
43	25	74	51	36	42	28	31
28	25	45	12	57	51	12	32
49	38	42	27	31	50	38	21
16	24	64	47	23	22	43	27
49	28	23	19	11	52	46	31
30	43	49	12				

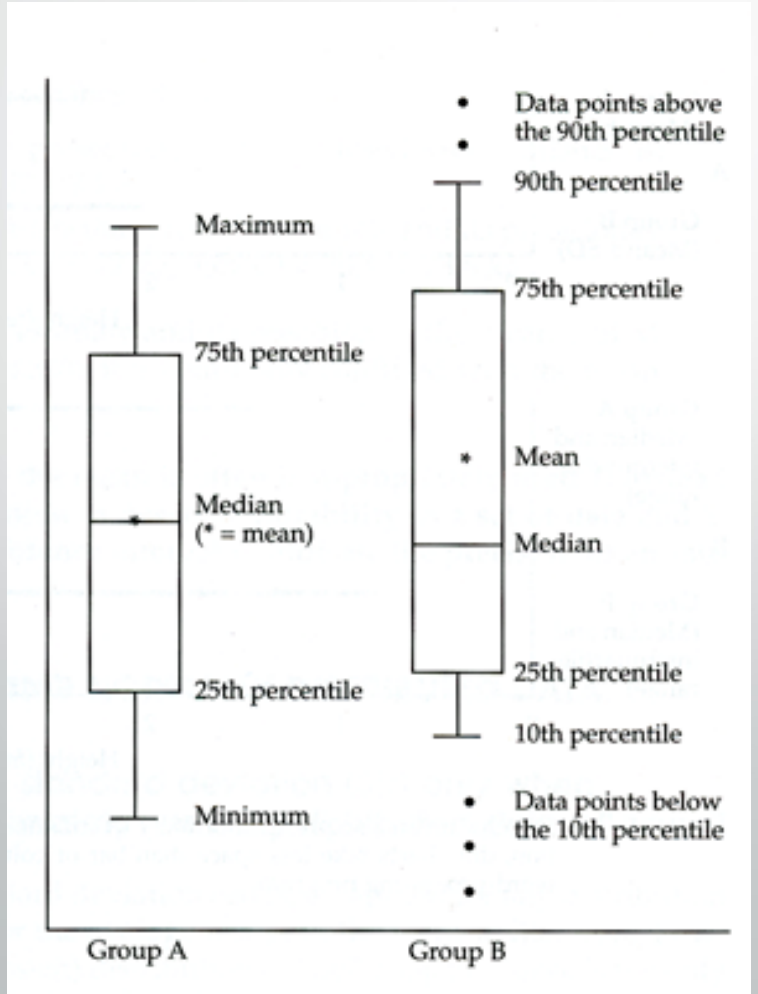
Stem and leaf plot

Stem-and-leaf of Age N = 60

Leaf Unit = 1.0

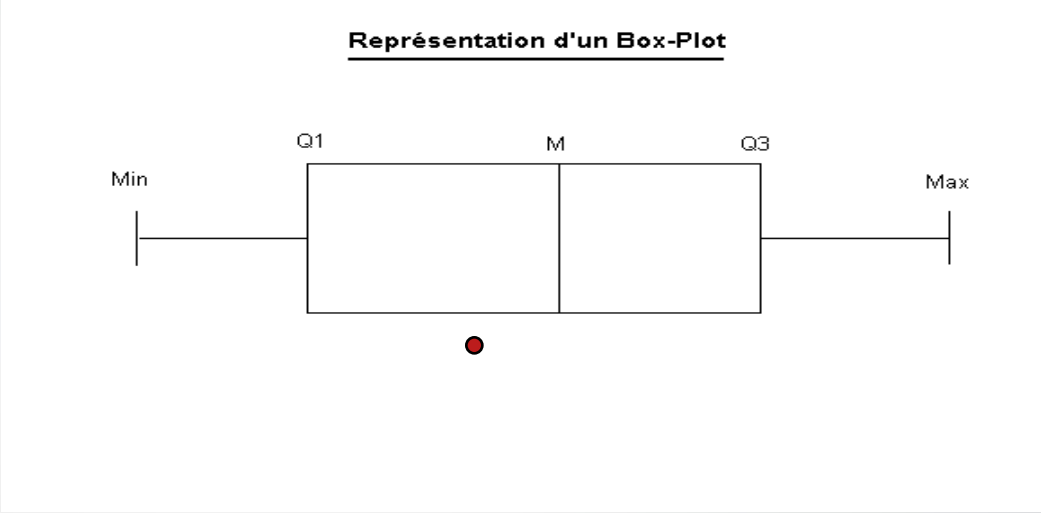
```
 6   1 122269
19   2 1223344555777788888
11   3 00111226688
13   4 2223334567999
 5   5 01127
 4   6 3458
 2   7 49
```

Box and Whiskers Plots



Descriptive statistics report: Boxplot

- minimum score
- maximum score
- lower quartile
- upper quartile
- median
- mean

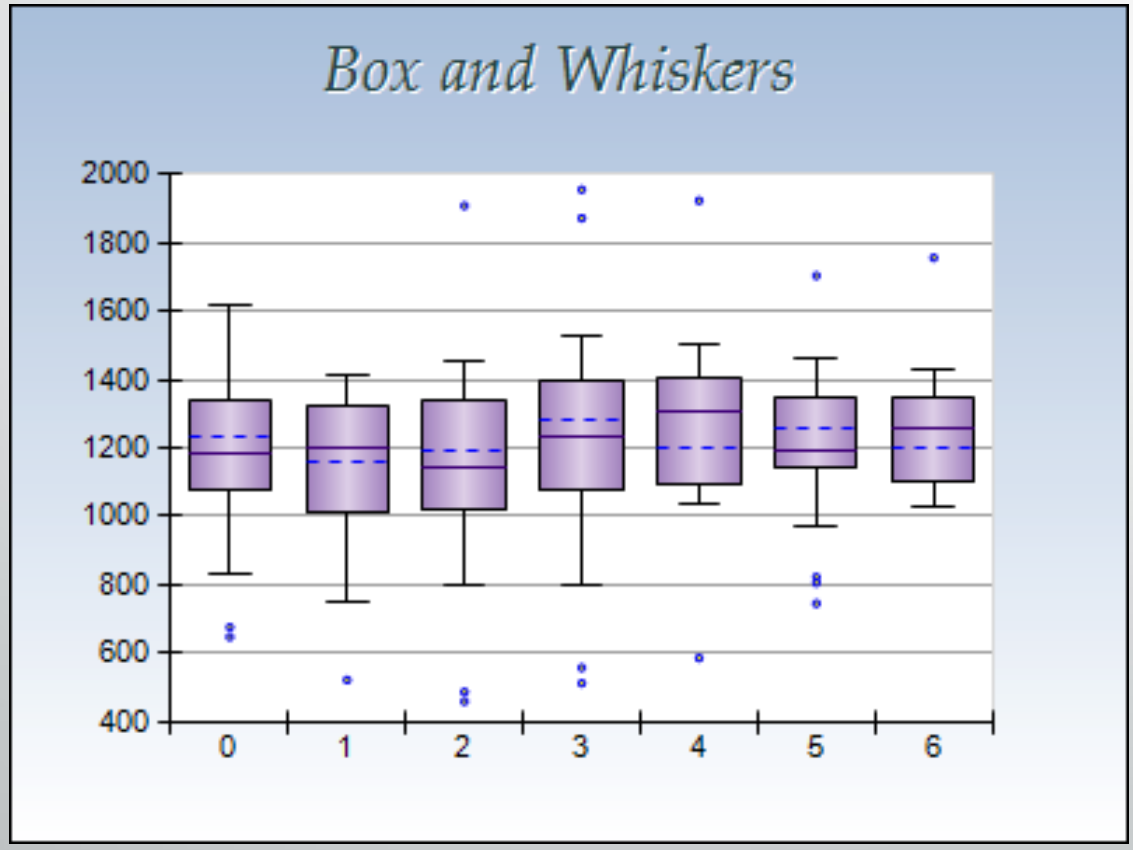


- The skew of the distribution

positive skew: mean > median & high-score whisker is longer

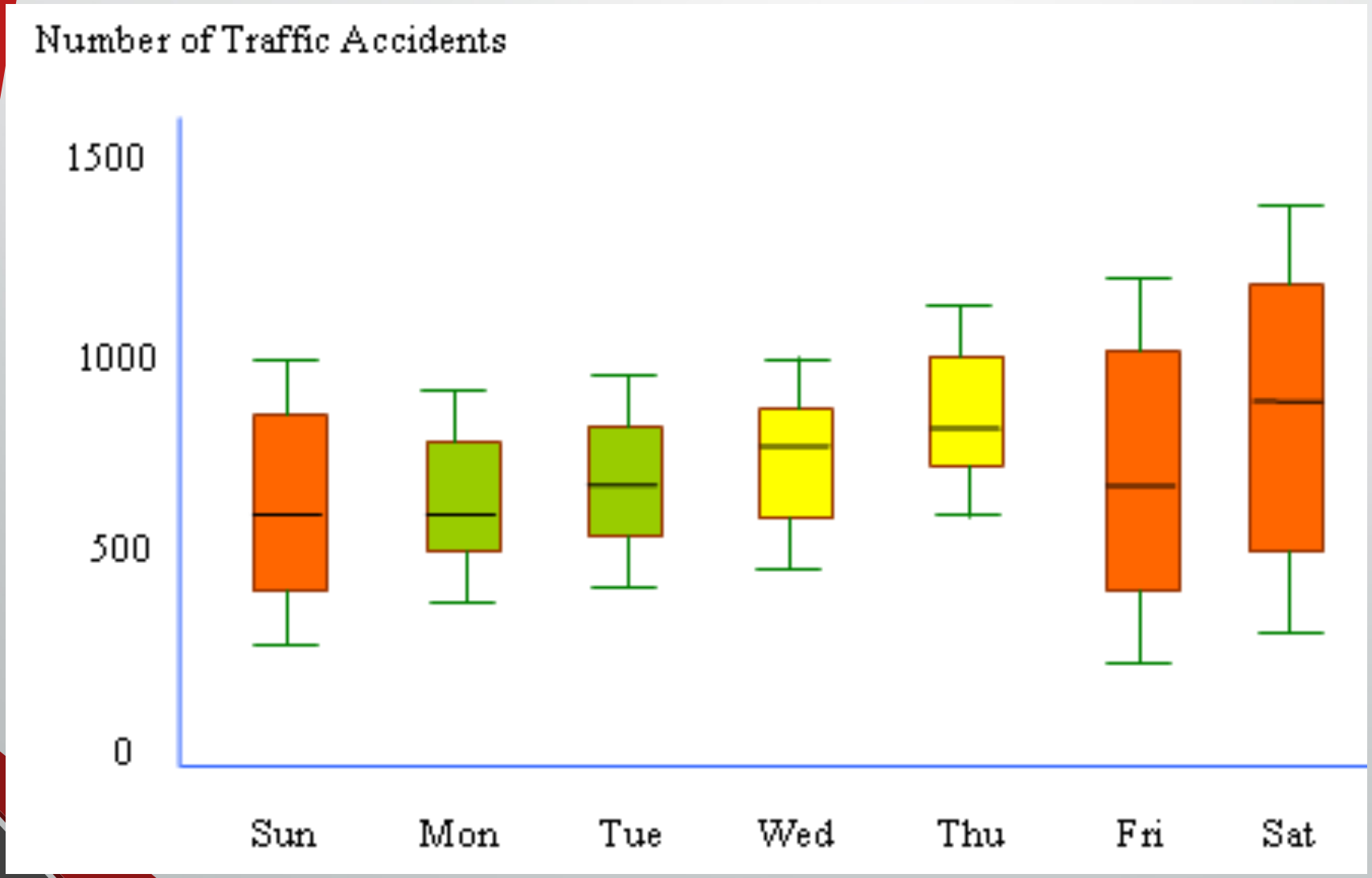
negative skew: mean < median & low-score whisker is longer

Box and Whisker Plots

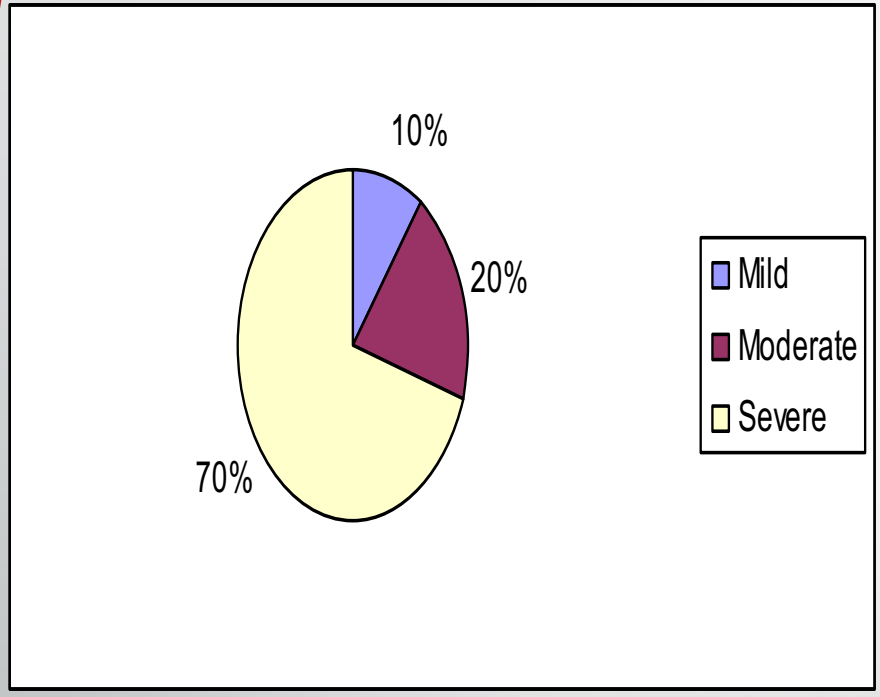


Popular in Epidemiologic Studies
Useful for presenting comparative data graphically

Application of a box and Whisker diagram



Pie Chart



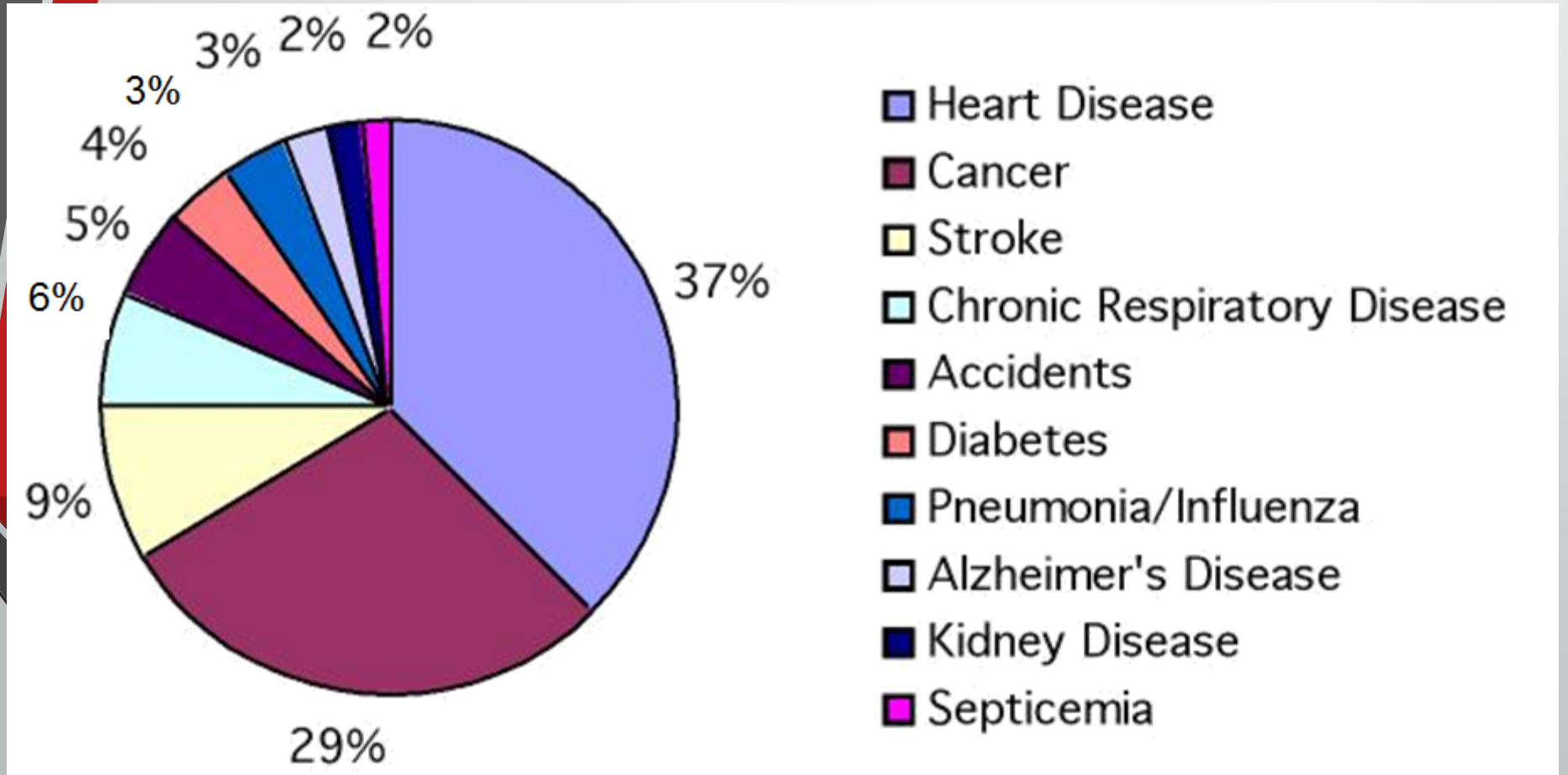
- Circular diagram – total -100%
- Divided into segments each representing a category
- Decide adjacent category
- The amount for each category is proportional to slice of the pie

The prevalence of different degree of Hypertension in the population

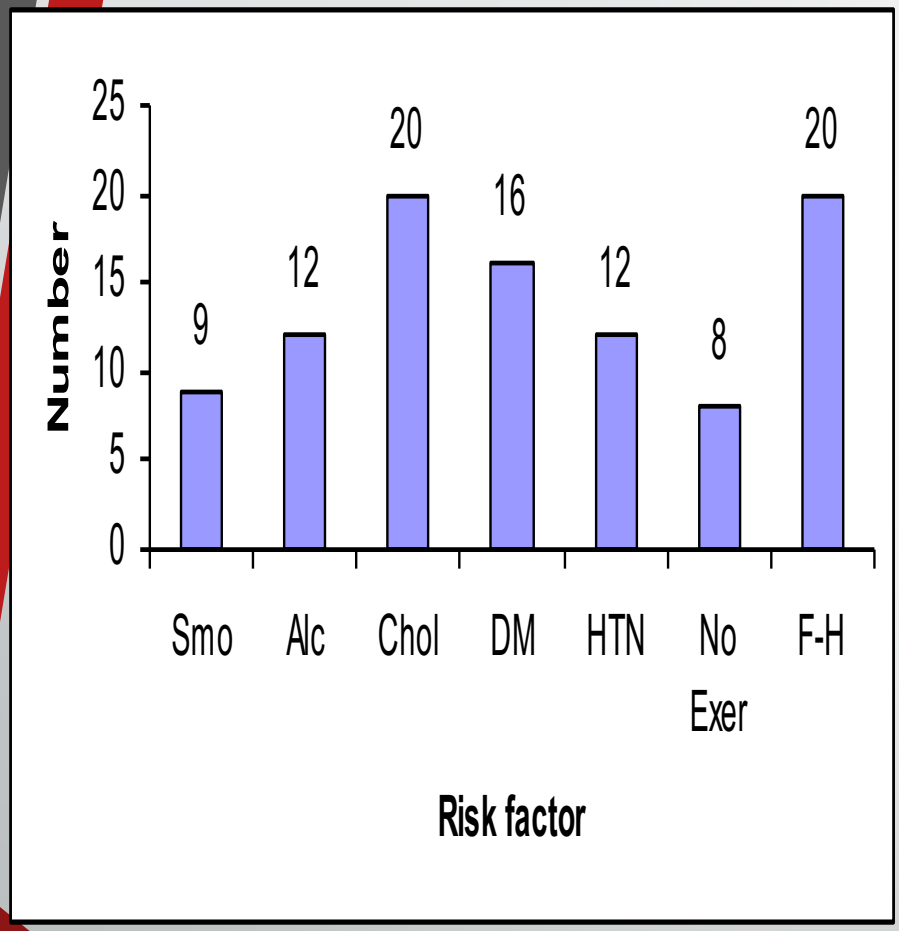
Top 10 causes of death: pie chart

Each slice represents a piece of one whole. The size of a slice depends on what percent of the whole this category represents.

Percent of people dying from top 10 causes of death in the United States in 2001



Bar Graphs



Heights of the bar indicates frequency

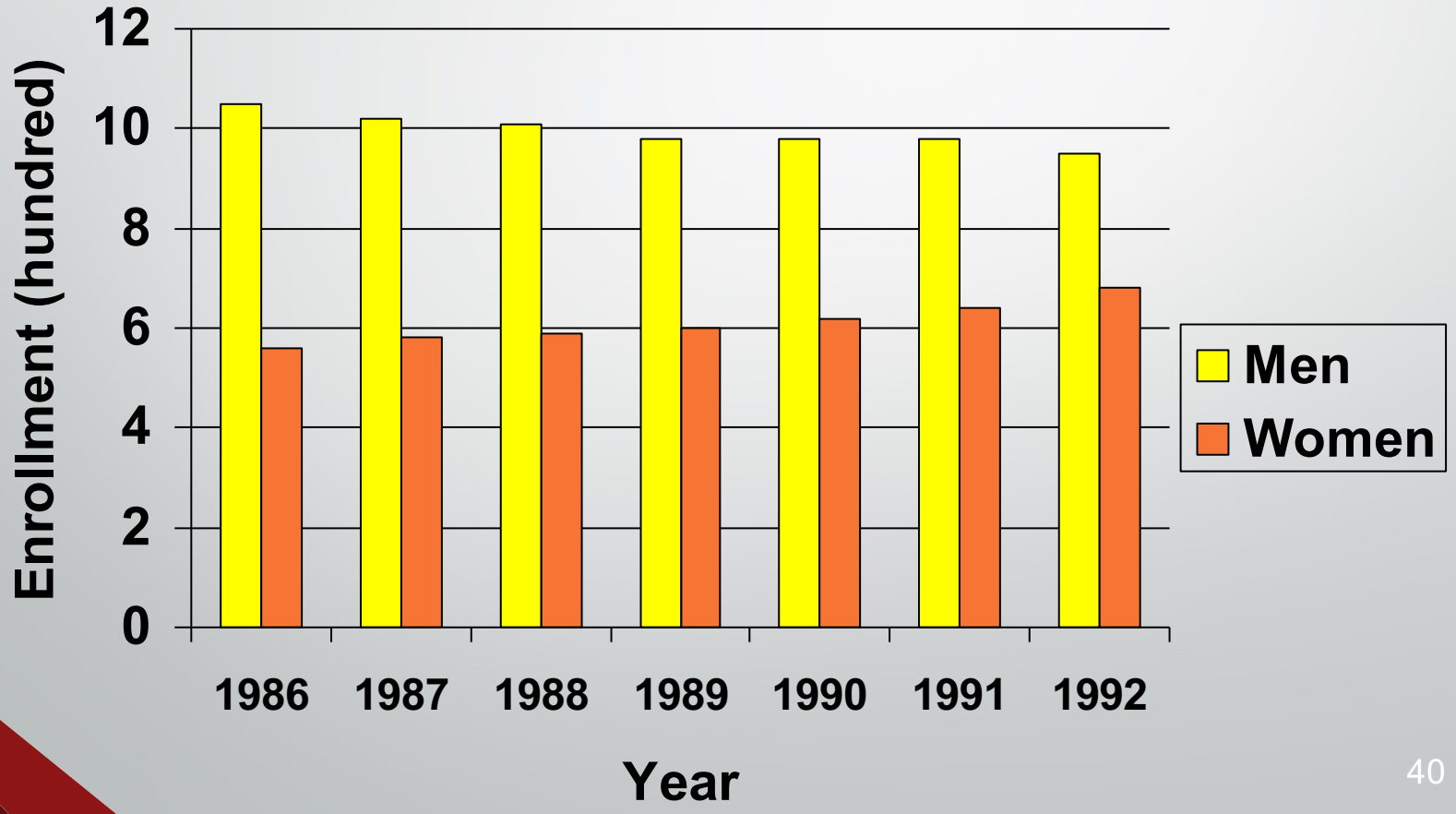
Frequency in the Y axis and categories of variable in the X axis

The bars should be of equal width and no touching the other bars

The distribution of risk factor among cases with Cardio vascular Diseases

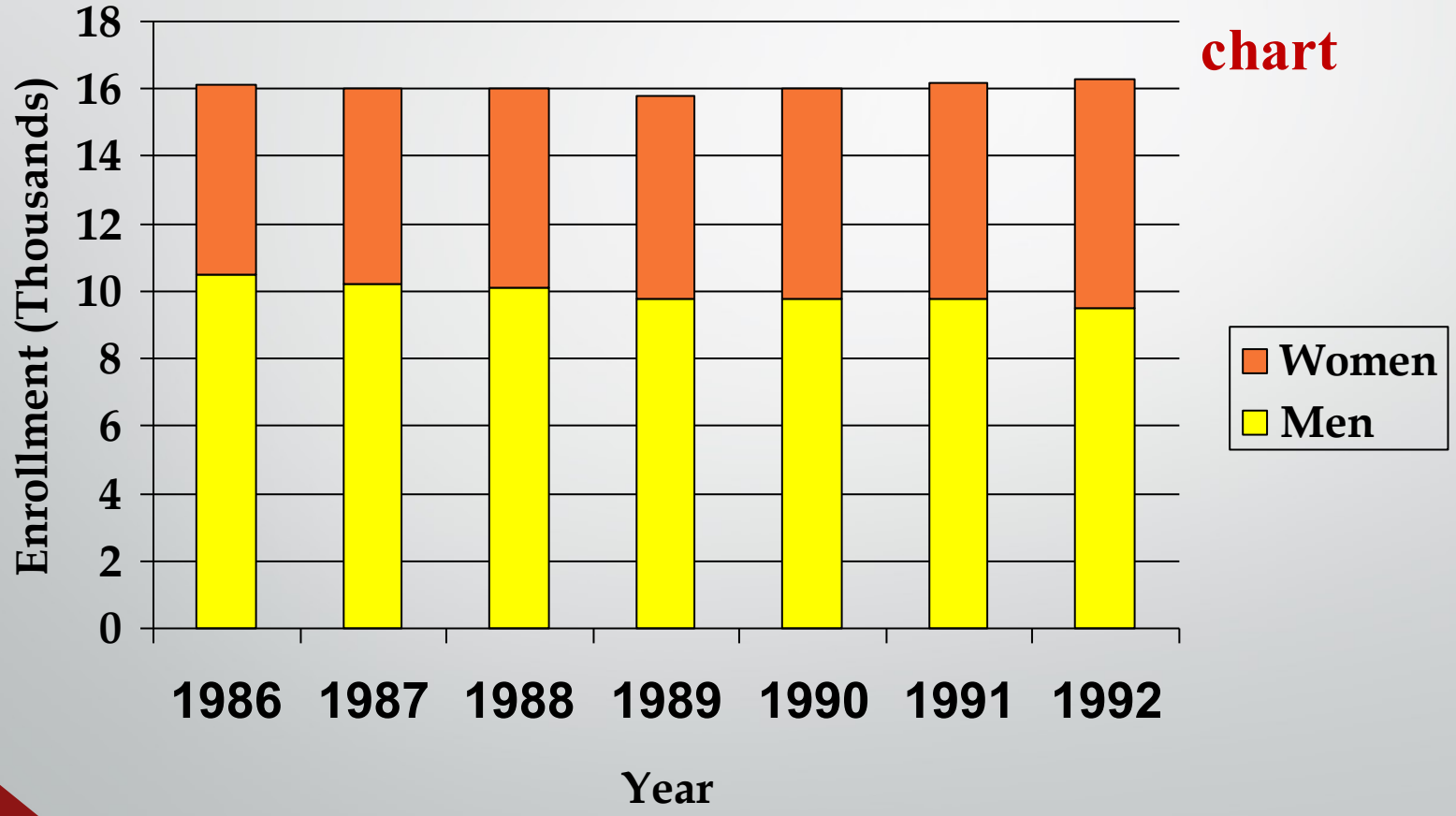
HIV cases enrolment in USA by gender

Bar chart



HIV cases Enrollment in USA by gender

Stocked bar chart



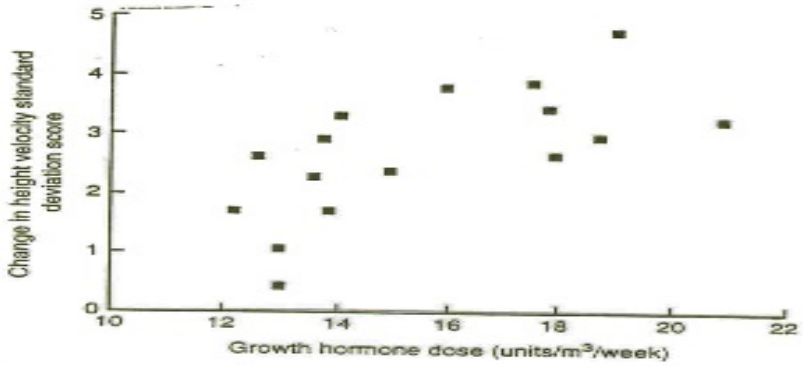


Figure 4.7 Relation between dose of growth hormone and change in height velocity standard deviation score over one year (after Hindmarsh and Brook, 1987, with permission)

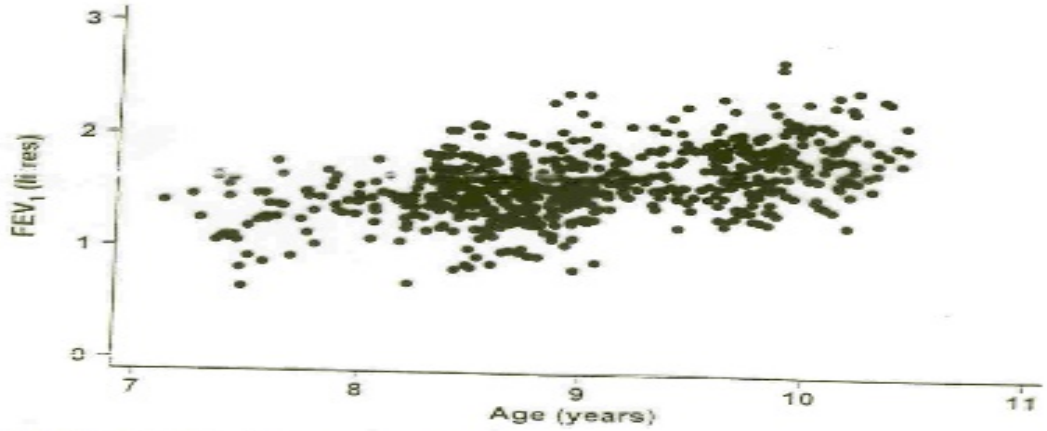
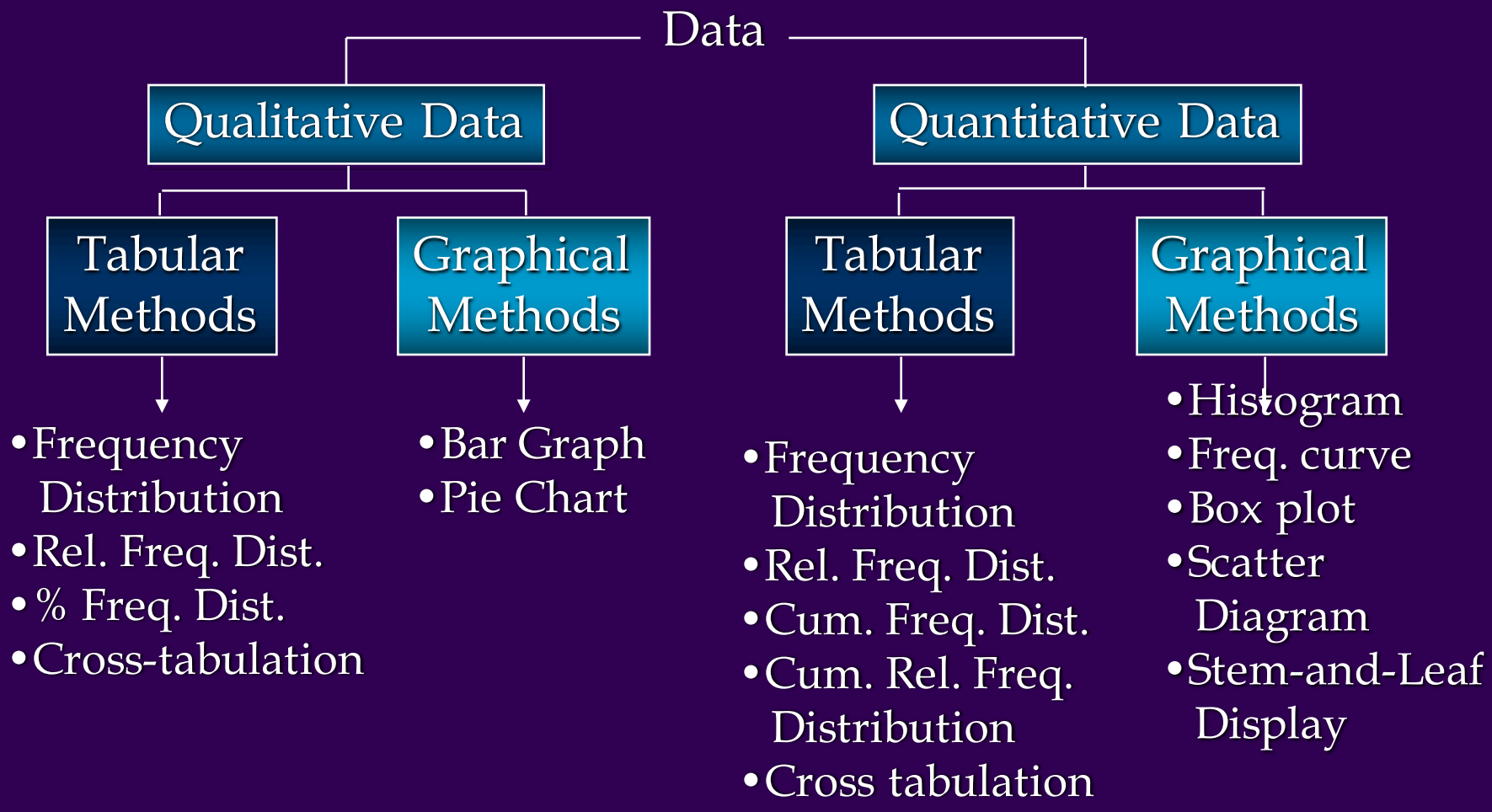


Fig. 3.9 Scatter plot showing the relationship between FEV_1 and age in 636 children living in a deprived suburb of Lima, Peru.

General rules for designing graphs

- A graph should have a self-explanatory legend
- A graph should help reader to understand data
- Axis labeled, units of measurement indicated
- Scales important. Start with zero (otherwise // break)
- Avoid graphs with three-dimensional impression, it may be misleading (reader visualize less easily

Tabular and Graphical Procedures



Any Questions?