GRAPHIC PRESENTATION OF DATA:
VISUALISING INFORMATION FOR BETTER UNDERSTANDING

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This presentation covers:

- Introduction
- The importance of graphic presentation
- Types of graphics presentation
- Principles of good graphic design
- Common mistakes to avoid

INTRODUCTION

Data presentation = process of showing data in a meaningful form

Two main types: Textual, Tabular & Graphical

Purpose: to make data easier to interpret and compare

IMPORTANCE OF GRAPHIC PRESENTATION

Graphs are powerful because they summarise complex information instantly.

A good graph can show relationships, trends, or comparisons much more quickly than a table or a paragraph.

- Enhances clarity and understanding
- Makes comparison easier
- Highlights patterns and trends
- Saves time in interpretation
- Increases visual appeal of reports

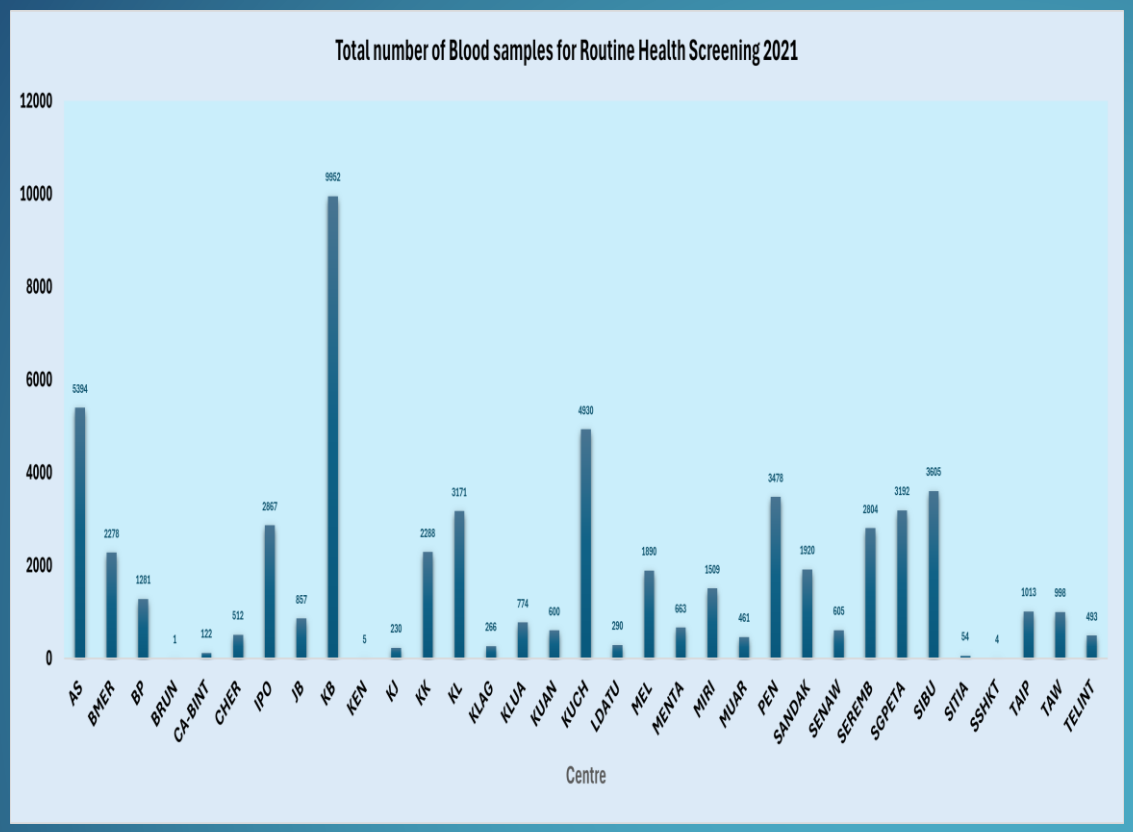
TYPES OF GRAPHIC PRESENTATION

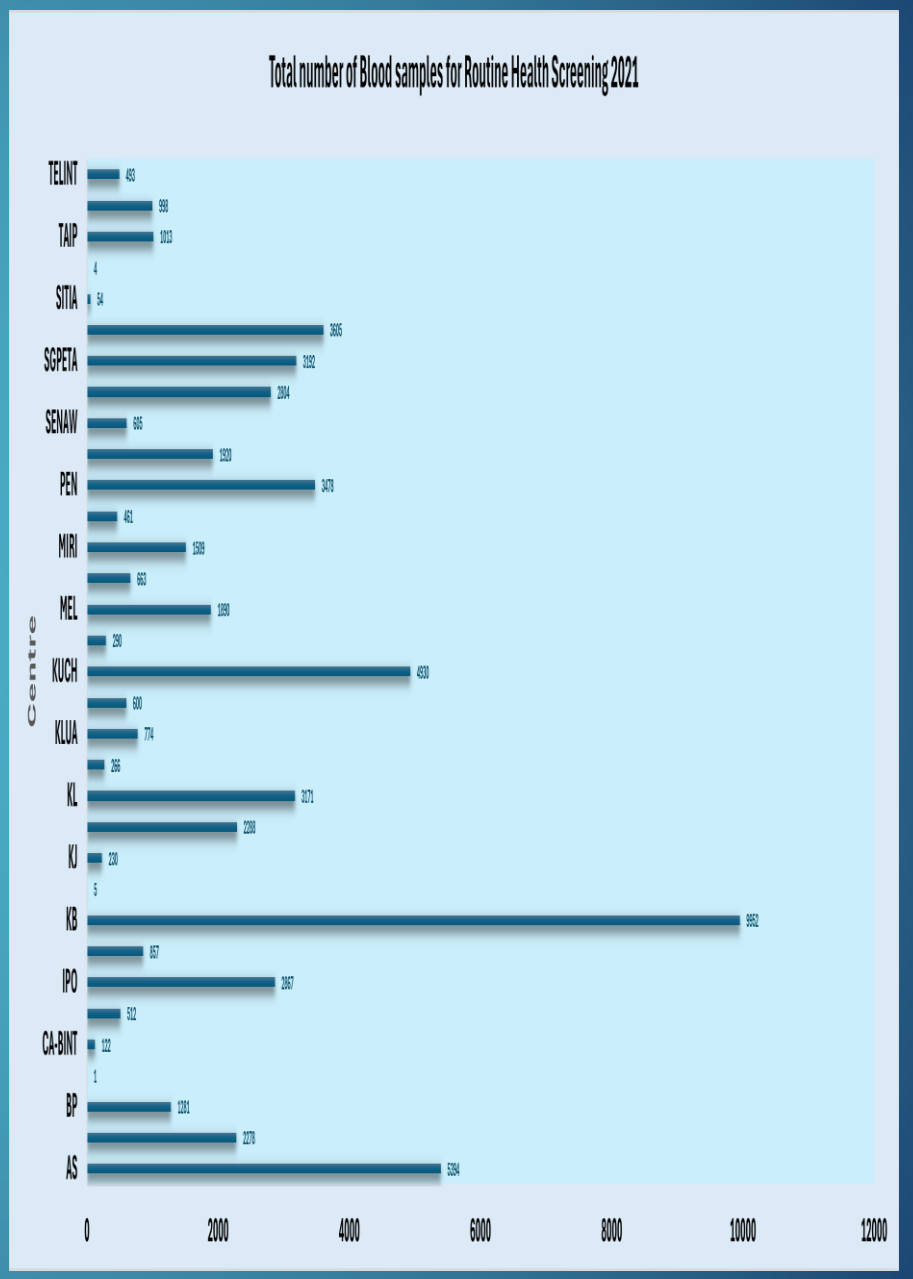
1. Bar Graphs – for comparing quantities
2. Pie Charts – for showing proportions
3. Histograms – for frequency distributions
4. Violin chart - for frequency distributions
5. Line Graphs – for trends over time
6. Scatter Plots – for relationships
7. Bubble Chart - To compare and visualize **relationships or patterns among three variables**.
8. Box and Whisker- For data distribution (Normality)
9. Pictograms – for visual appeal
10. Forest Plot – for summarising meta-analysis

Bar Graph

- Represents data with rectangular bars
- Bars can be vertical or horizontal
- Equal width, different lengths
- Useful for categorical data
- Types:
  - Vertical Bar Chart
  - Horizontal Bar Chart
  - Stacked Bar Chart
  - Grouped Bar chart

Horizontal and Vertical Bar Chart





Example of stacked & Grouped Bar plot

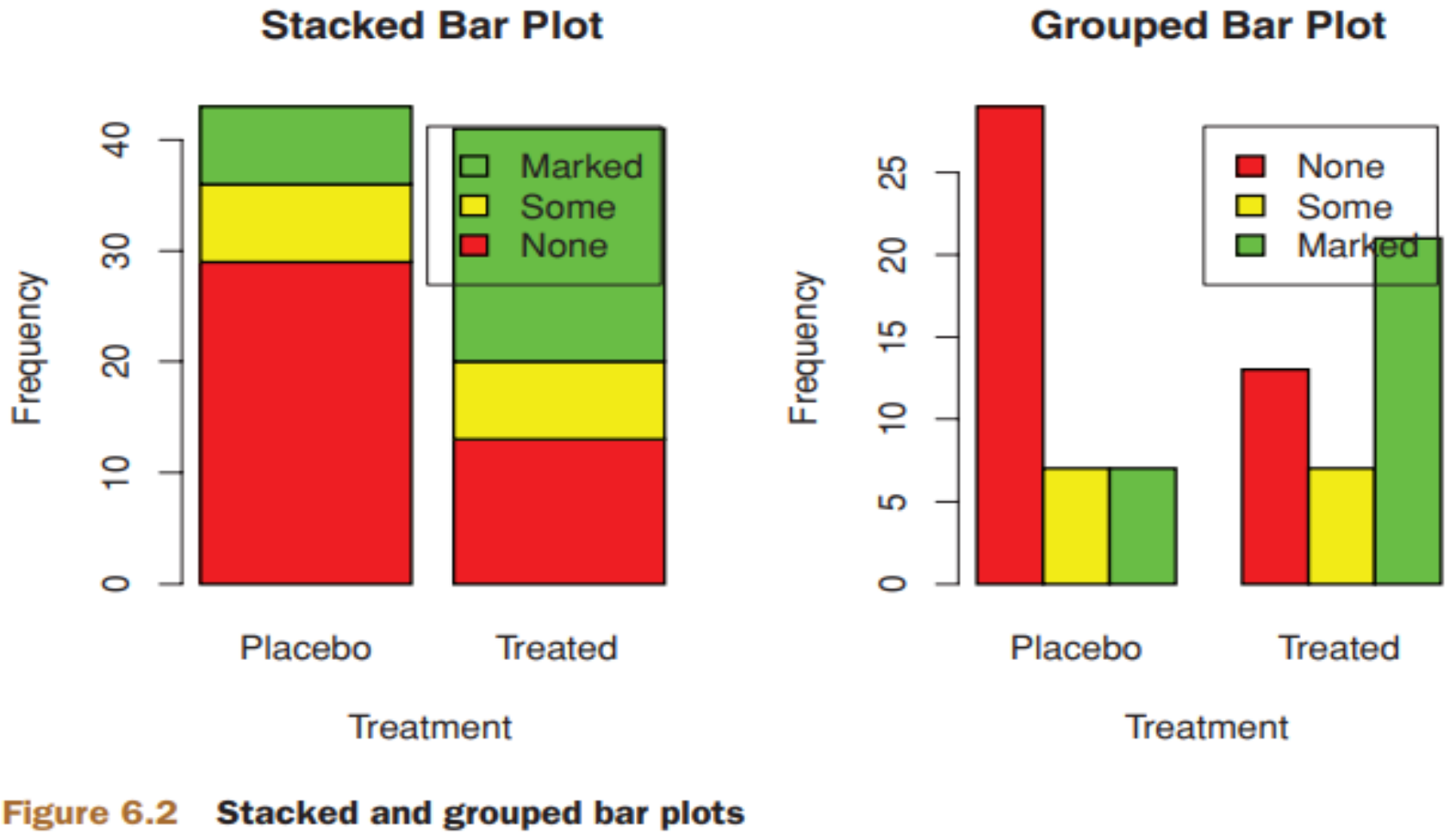


Figure 6.2 Stacked and grouped bar plots

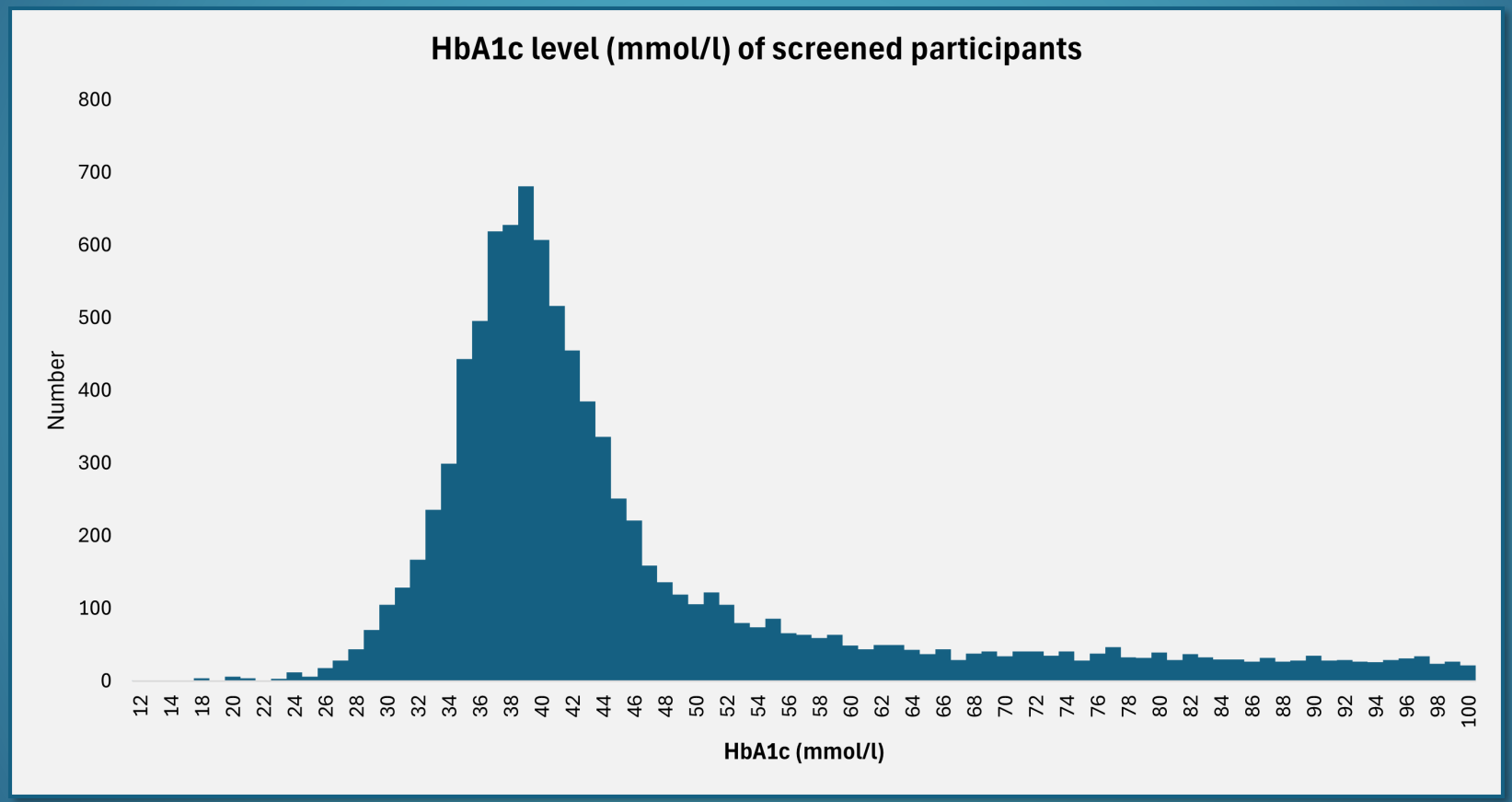
Source: Kabacoff, R. (2022). *R in action: data analysis and graphics with R and Tidyverse*. Simon and Schuster.

Histogram

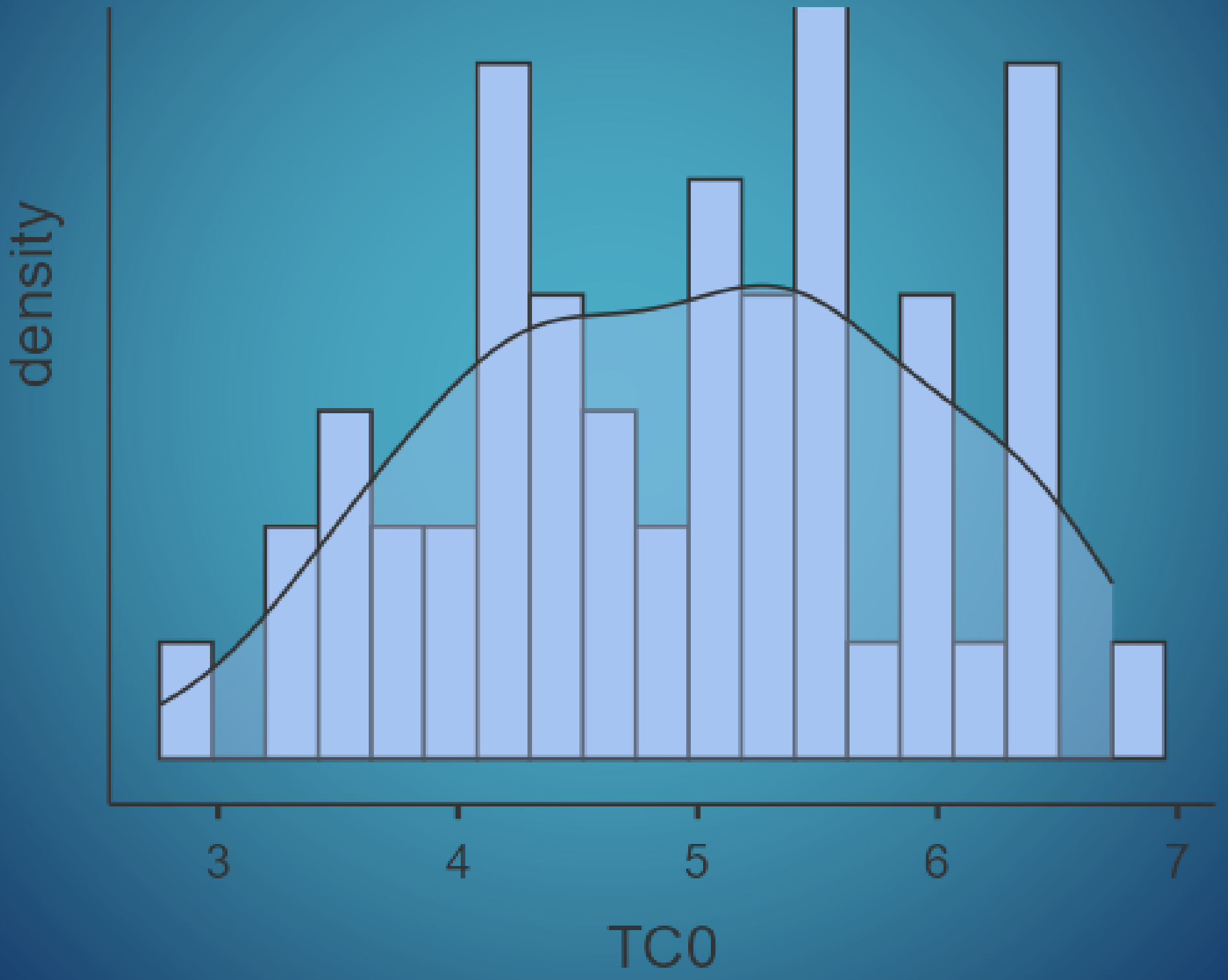
- Similar to bar graph but for continuous data
- Bars touch each other
- Shows frequency distribution

- Example: The HbA1c levels of the respondents

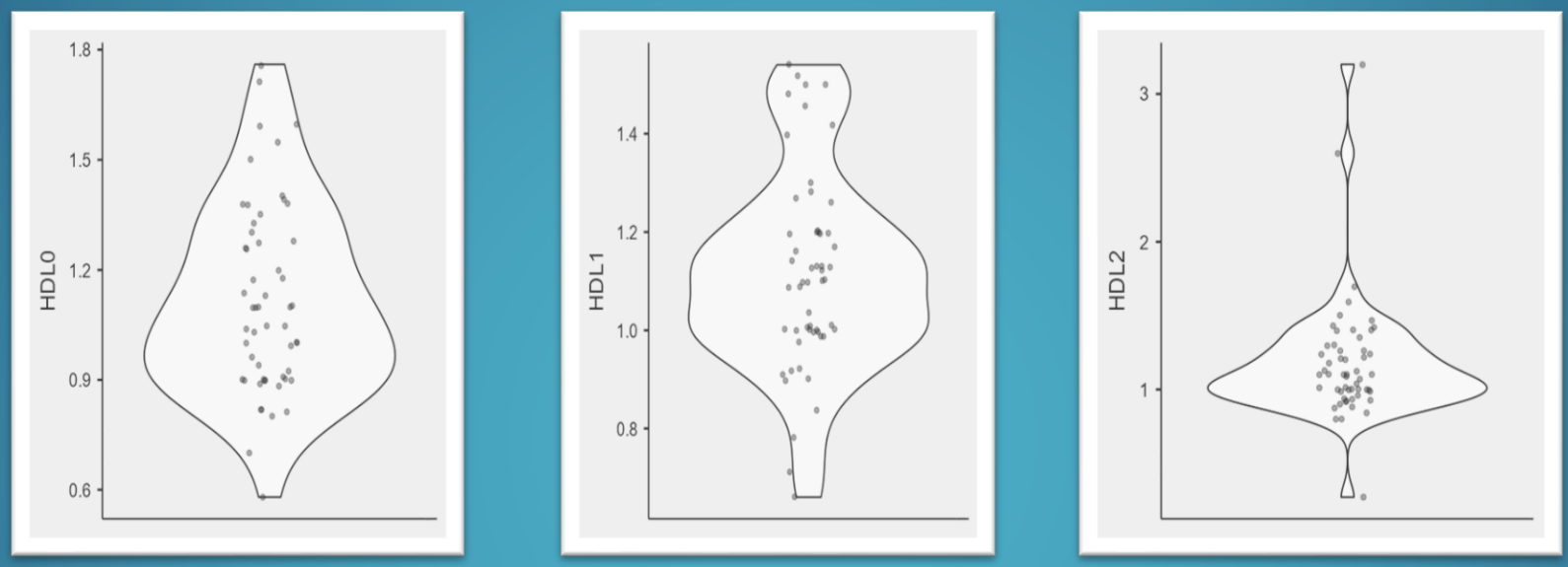
Histogram


HbA1c level (mmol/l) of screened participants
Number
800
700
600
500
400
300
200
100
0
12 14 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100
HbA1c (mmol/l)

Histogram overlay with density curve



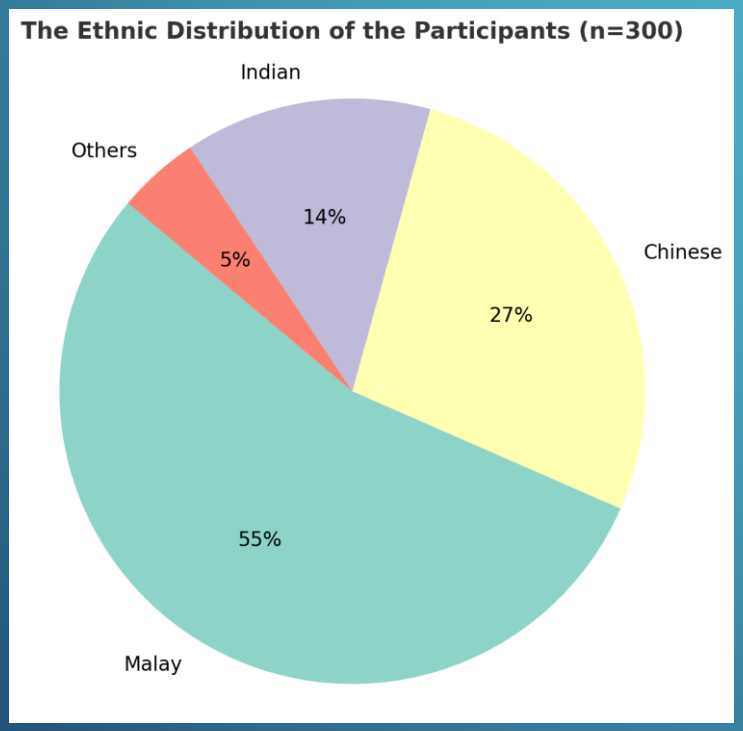
Violin Plot

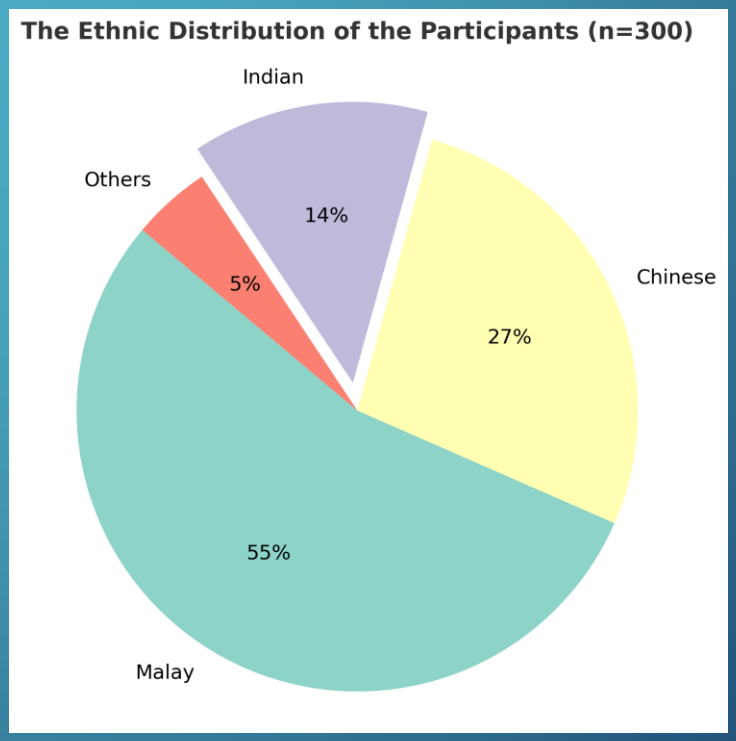


- A **violin plot** combines features of a **boxplot** and a **density plot**
- It displays the **distribution**, **probability density**, and **spread** of the data.
- The **shape of the violin** shows how the data are distributed (e.g., **symmetric**, **skewed**, or **bimodal**).
- **Dots or lines** inside the plot can represent **individual data points** or **summary statistics** such as the **median**.

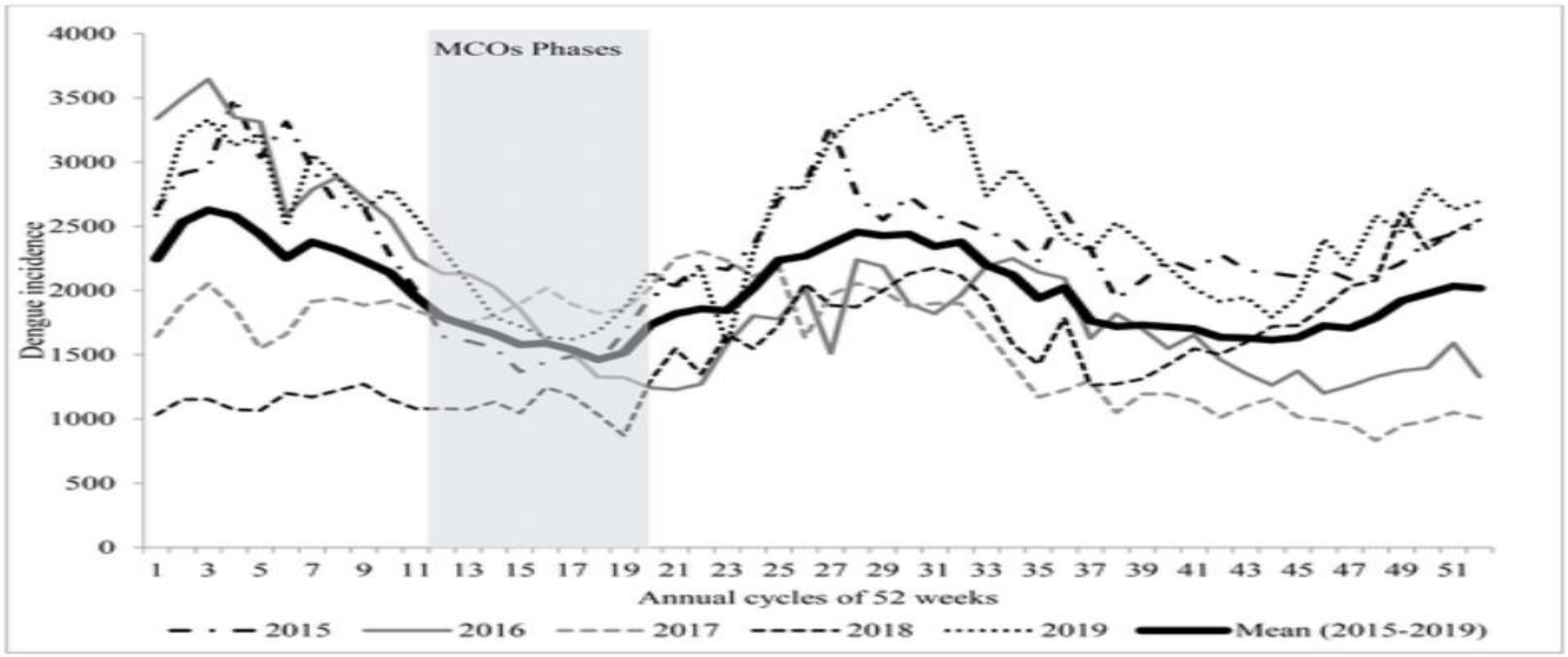
Pie Chart

- ✓ Circle divided into slices representing parts of a whole
- ✓ Good for percentage or proportion data
- ✓ Total always equals 100%





Line Graph



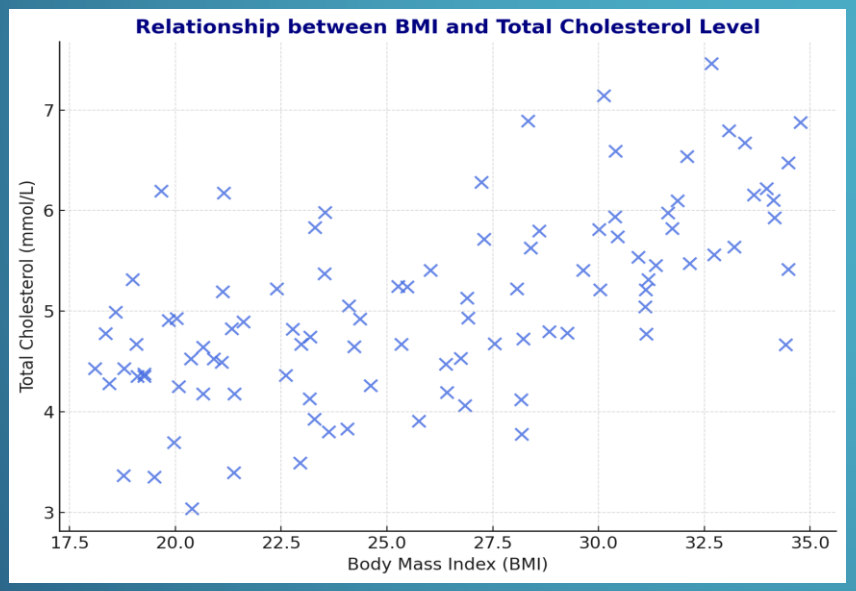
Annual cycle of dengue fever cases trend in Peninsular Malaysia from 2015 to 2019. Note: The grey area indicates the early stage of MCO implementation in Malaysia which consist of MCO I: 18 th March to 31 st March 2020, MCO II; 1 st April 2020 to 14 th April 2020, MCO III: 15 th April to 28 th April 2020).

Source: Rahim, M. H., Dom, N. C., Ismail, S. N. S., Abd Mulud, Z., Abdullah, S., & Pradhan, B. (2021). The impact of novel coronavirus (2019-nCoV) pandemic movement control order (MCO) on dengue cases in Peninsular Malaysia. *One Health*, *12*, 100222.

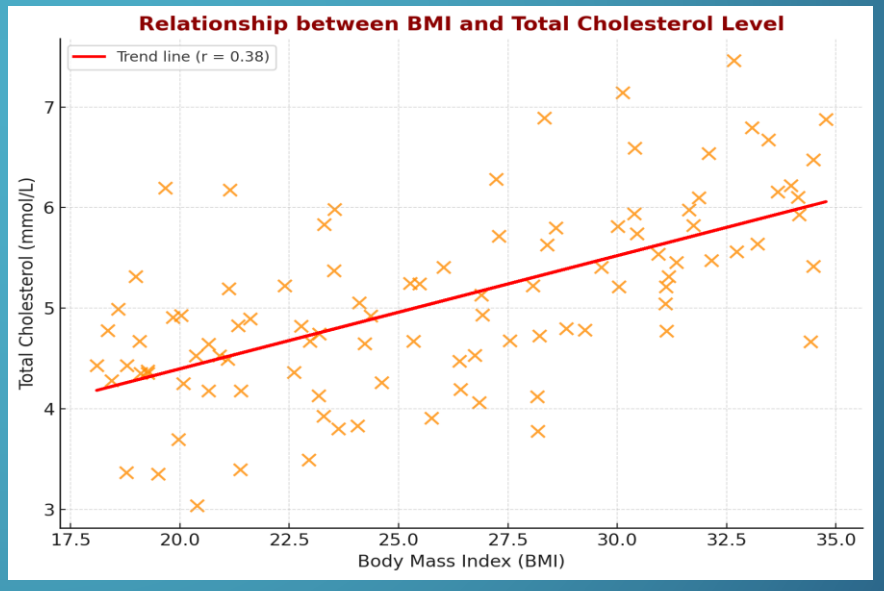
- Points connected by lines
- Shows change over time
- Useful for time-series data (e.g., monthly dengue cases)

Scatter Plot

- ✓ Plots pairs of variables (X and Y)
- ✓ Shows relationship or correlation between 2 variables



Without Trendline (Hypothetical data)



With Trendline (Hypothetical data)

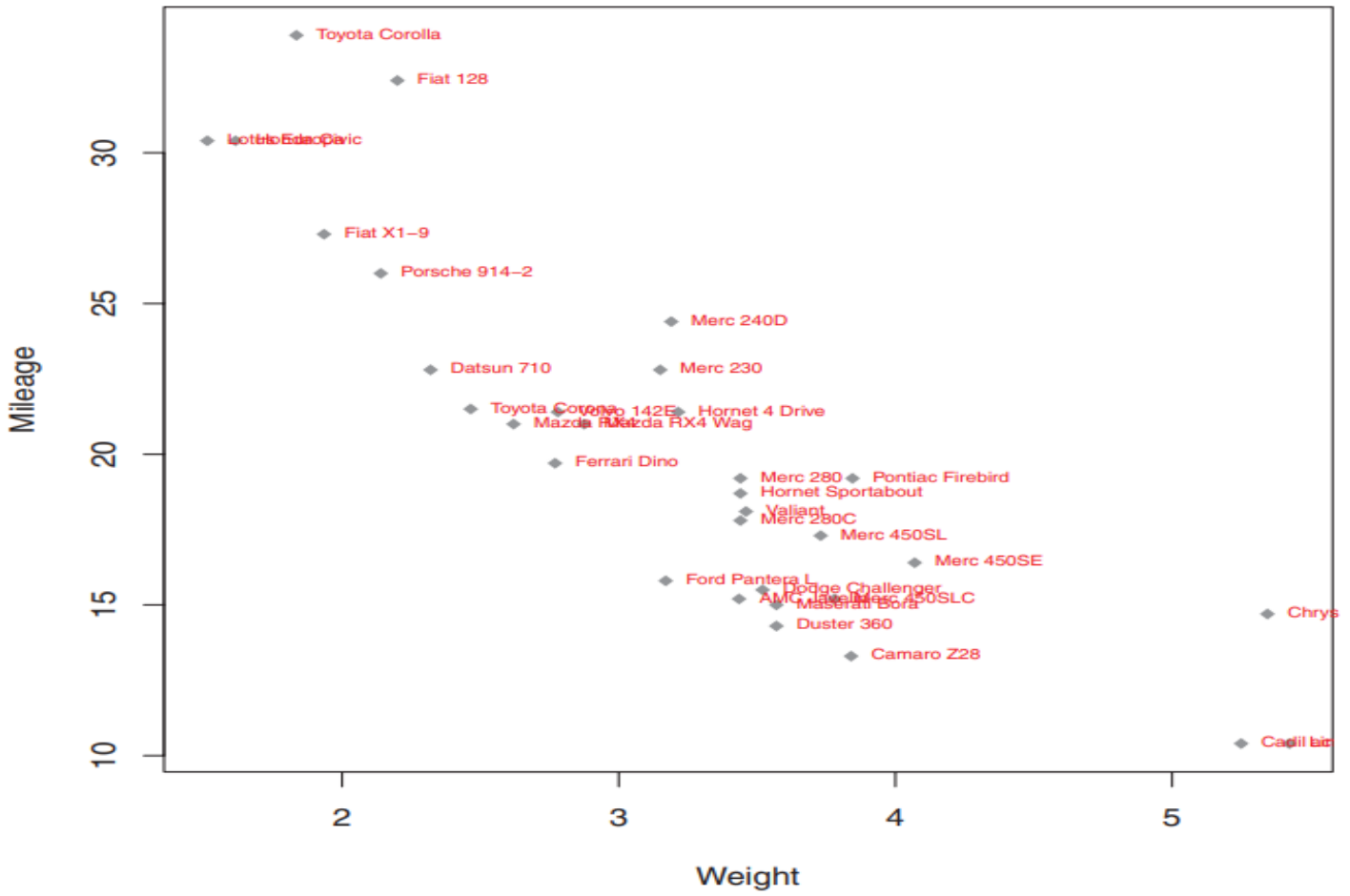
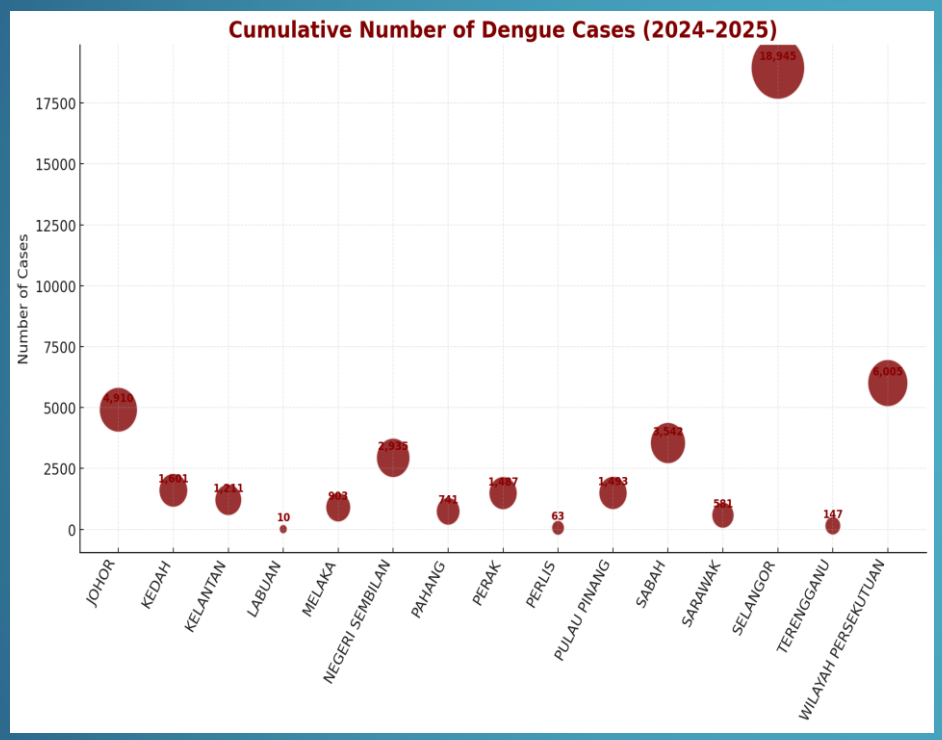


Figure 3.11 **Example of a scatter plot (car weight vs. mileage) with labeled points (car make)**

Source: Kabacoff, R. (2022). *R in action: data analysis and graphics with R and Tidyverse*. Simon and Schuster.

Bubble Chart



- A bubble chart is an enhanced scatter plot that uses bubbles (circles) to display three variables in two dimensions.
- Shows relationships among three variables

Box & Whisker

- ✓ Displays data distribution
- ✓ Shows five-number summary
- ✓ Identifies outliers
- ✓ Visualises skewness
- ✓ Facilitates comparison

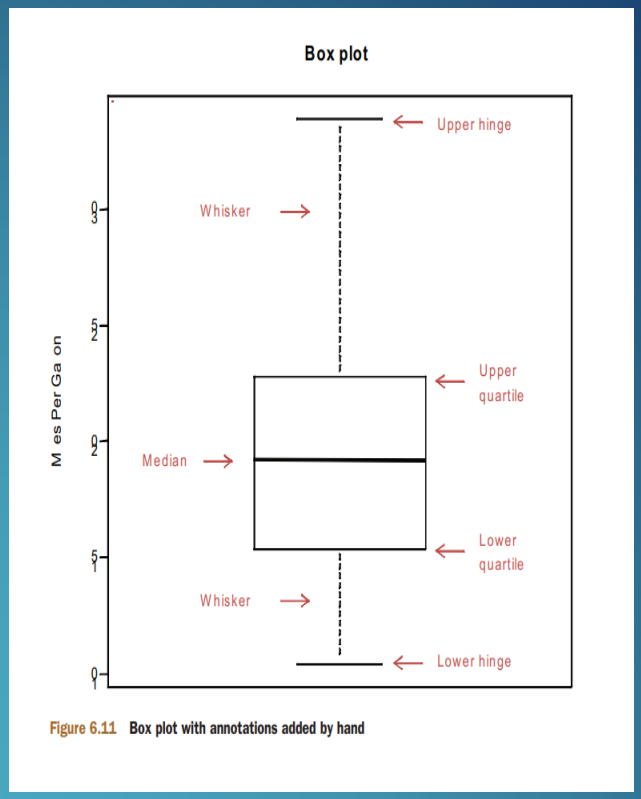
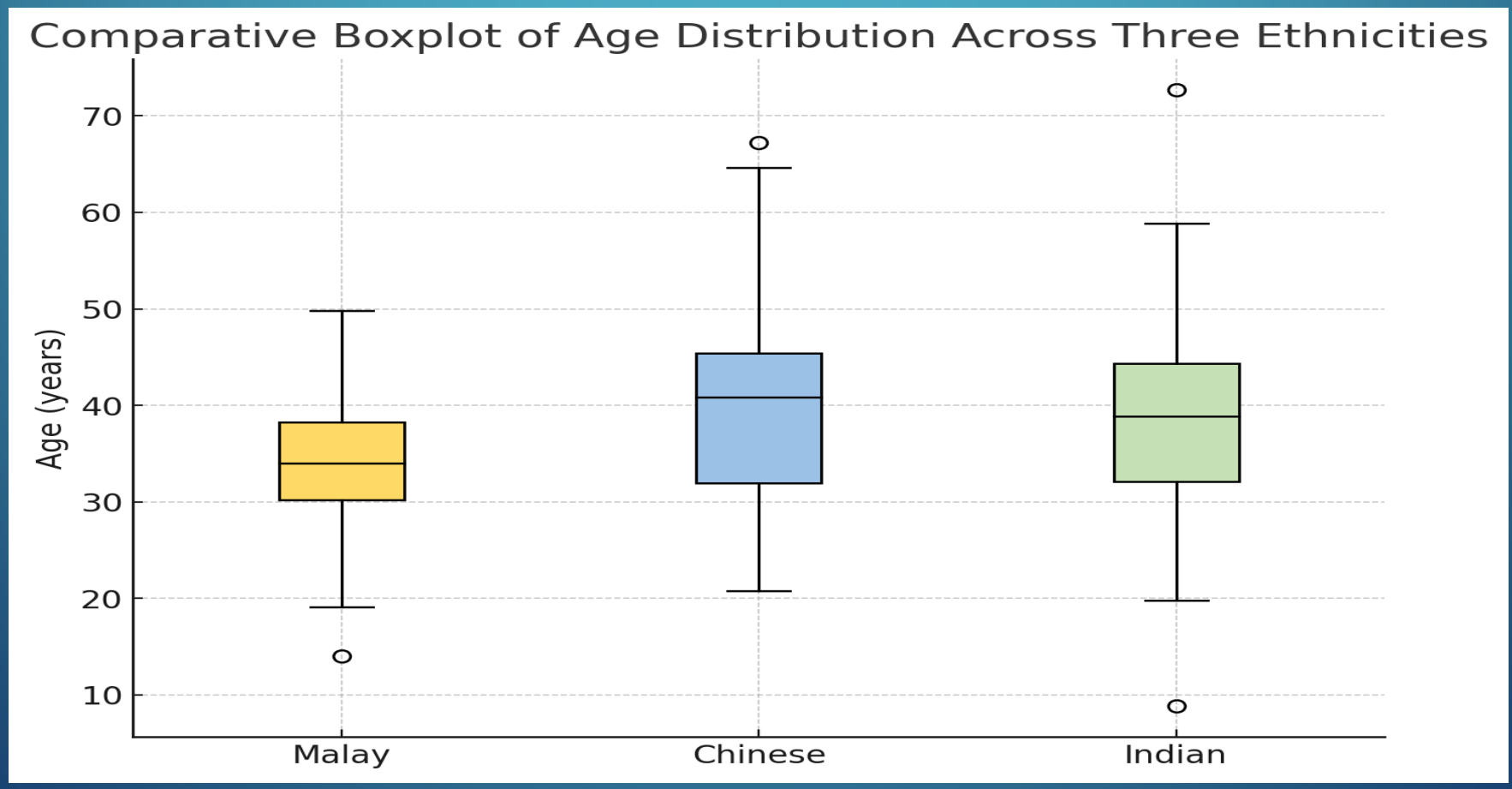


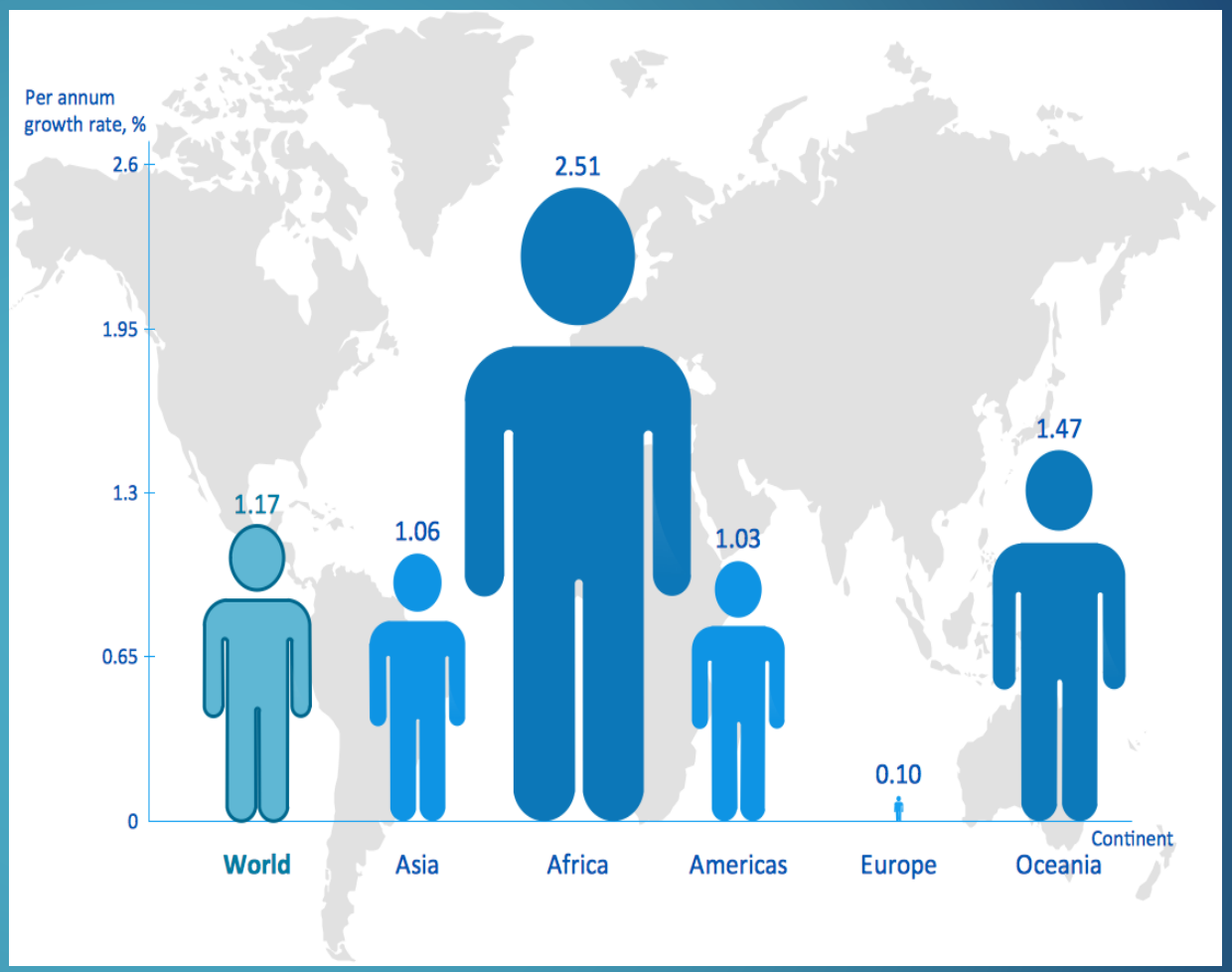
Figure 6.11 Box plot with annotations added by hand

Source: Kabacoff, R. (2022). *R in action: data analysis and graphics with R and Tidyverse*. Simon and Schuster.



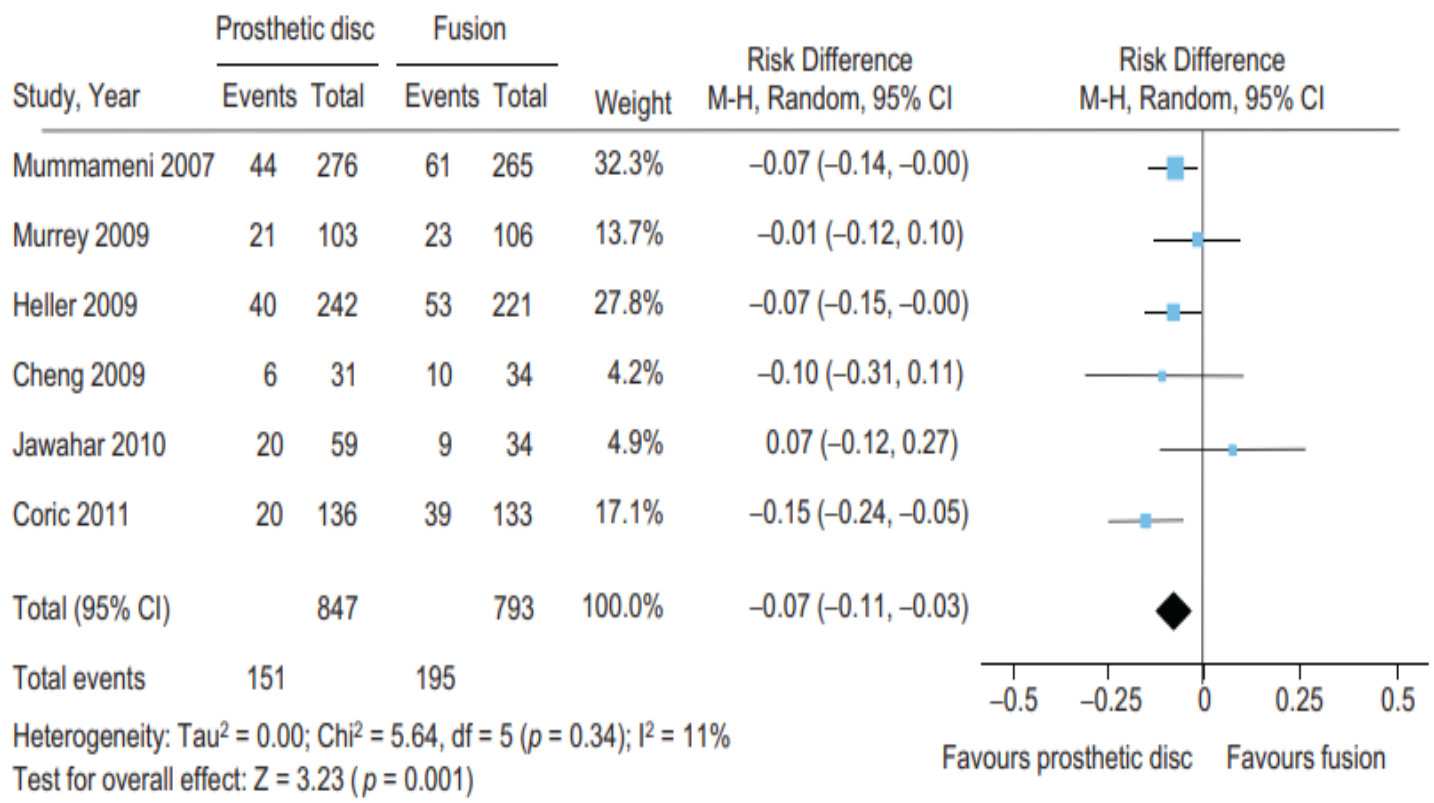
Pictogram

- Uses pictures or symbols to represent data
- Attracts attention, easy to understand
- Best for simple data sets



Source: https://www.conceptdraw.com/examples/picture-graph

Forest Plot



Study, Year	Prosthetic disc Events	Total	Fusion Events	Total	Weight	Risk Difference M-H, Random, 95% CI
Mummameni 2007	44	276	61	265	32.3%	−0.07 (−0.14, −0.00)
Murrey 2009	21	103	23	106	13.7%	−0.01 (−0.12, 0.10)
Heller 2009	40	242	53	221	27.8%	−0.07 (−0.15, −0.00)
Cheng 2009	6	31	10	34	4.2%	−0.10 (−0.31, 0.11)
Jawahar 2010	20	59	9	34	4.9%	0.07 (−0.12, 0.27)
Coric 2011	20	136	39	133	17.1%	−0.15 (−0.24, −0.05)
Total (95% CI)		847		793	100.0%	−0.07 (−0.11, −0.03)
Total events	151		195			

Heterogeneity: $Tau^2 = 0.00$; $Chi^2 = 5.64$, $df = 5$ ($p = 0.34$); $I^2 = 11\%$
Test for overall effect: $Z = 3.23$ ($p = 0.001$)

Risk Difference M-H, Random, 95% CI

−0.5 −0.25 0 0.25 0.5

Favours prosthetic disc Favours fusion

Figure 2. Meta-analysis of trials of the effect of prosthetic disc versus cervical fusion on recovery in people with chronic disabling neck pain, using a random-effects model and the Mantel-Haenszel method. Test for heterogeneity: $chi^2 = 5.64$, $I^2 = 11\%$, $p = 0.34$.
Modified from the systematic review by Verhagen and colleagues.[13]

Source: Verhagen, A. P., & Ferreira, M. L. (2014). Forest plots. *Journal of physiotherapy*, *60*(3), 170-173.

- The forest plot is the standard method for graphically displaying the results of a meta-analysis
- Common in meta-analyses for presenting results of the individual studies and the overall estimate (pooled result).

PRINCIPLES OF GOOD GRAPH DESIGN

- Keep it simple and clear
- Self explanatory
- Label axes and units properly
- Use appropriate scales
- Avoid misleading visuals
- Choose the right type of graph

COMMON MISTAKES TO AVOID

Using 3D effects unnecessarily

Inconsistent scales or intervals

Too much color or text

Missing labels or legends

Summary

- Graphs simplify complex data
- Choose the right graph for your data type
- Maintain clarity, accuracy, and visual appeal

Reference

- Franconeri, S. L., Padilla, L. M., Shah, P., Zacks, J. M., & Hullman, J. (2021). The science of visual data communication: What works. *Psychological Science in the public interest*, *22*(3), 110-161.
- Kabacoff, R. (2022). *R in action: data analysis and graphics with R and Tidyverse*. Simon and Schuster.
- Frost, J. (2020). Introduction to statistics. Statistics By Jim Publishing.

Thank you