بسم الله الرحمن الرحيم

# Statistics for the clinicians

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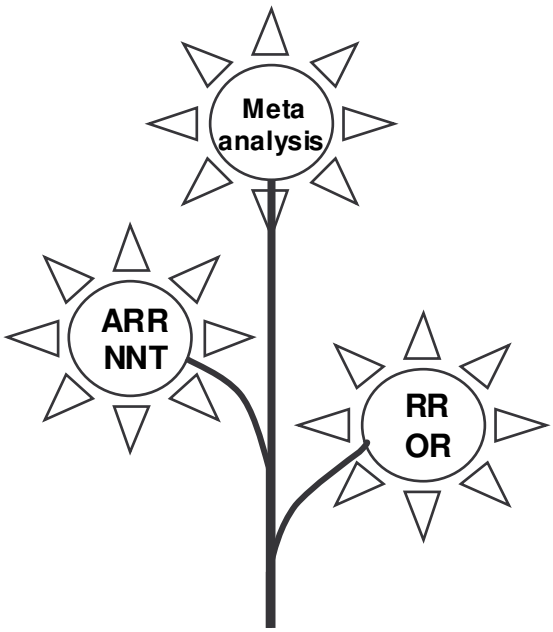
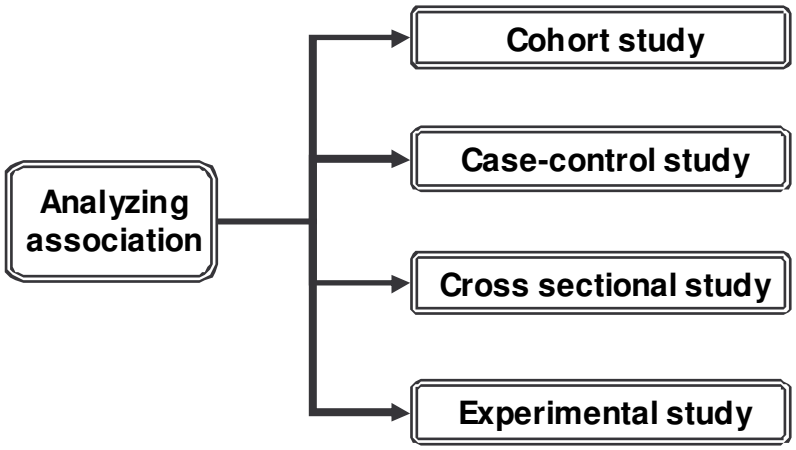

Meta analysis
ARR NNT
RR OR

# RR & OR


Analyzing association
Cohort study
Case-control study
Cross sectional study
Experimental study

## Relative risk (RR)

- In **Cohort & experimental** studies
- Exposure (therapy) → outcome
- Example: Smoking and lung cancer

| | Smokers | Non smokers |
|---|---|---|
| Total | 1000 | 1000 |
| Lung cancer | 120 | 20 |
| Risk | 120/1000=0.12 | 20/1000=0.02 |
| RR | 0.12/0.02 = 6 | |

**The risk of cancer lung is 6 times in smokers than non smokers**

## Odds ratio (OR)

- In **Case control** studies
- Outcome → Exposure
- Example: Smoking and lung cancer.

| | Lung cancer | Controls |
|---|---|---|
| Total | 1000 | 1000 |
| Smokers | 800 | 250 |
| Non smokers | 200 | 750 |
| Odds | 800/200 = 4 | 250/750 = 0.33 |
| OR | 4/0.33 = 12.12 | |

**The odds of smoking is 12 times more in cancer lung cases than controls**

## Odds ratio (OR)

- In **Cross sectional** studies
- Outcome & Exposure → at the same time
- Example: Smoking and lung cancer

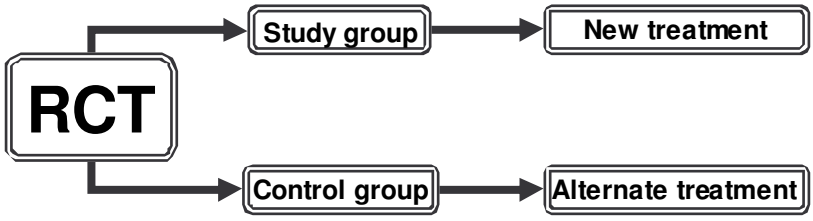
| | Smokers | Non smokers |
|---|---|---|
| Lung cancer | 100 | 10 |
| No cancer | 400 | 200 |
| Odds | 100/400 = 0.25 | 10/200 = 0.05 |
| OR | 0.25/0.05 = 5 | |

**The odds of cancer lung is 5 times more in smokers than non smokers**

## RR & OR

- RR or OR = 1 → No difference between the groups.
- RR or OR > 1 → Exposure is liked to outcome.
- The more the RR or OR → The more the risk.
- RR or OR < 1 → Exposure is protective against outcome.
- The Less the RR or OR → The more the protection.
- In rare outcomes, the OR approximates RR.
- RR or OR doesn't give any information about the absolute risk

## The randomized controlled study (RCT)




| | Success | Failure | Total |
|---|---|---|---|
| Drug A | 80 | 20 | 100 |
| Drug B | 60 | 40 | 100 |

## ARR & NNT

Experimental event rate (EER) = 80 ÷ 100 = 0.8

Control event rate (CER) = 60 ÷ 100 = 0.6

Absolute risk reduction (ARR) = EER – CER

ARR = 0.8 – 0.6 = 0.2

The difference in success = 20%

# ARR → NNT

## NNT

- The number of patients needed to be treated to effect **one extra benefit** than the conventional line of treatment.

**NNT = 1 / ARR**

**The smaller the NNT the better the new treatment**

# Meta-analysis

- It is the statistical (quantitative) combination of the results of 2 or more studies addressing the same research question.
- Although most of systematic reviews contain meta-analysis, yet it is not an essential part of the systematic review.

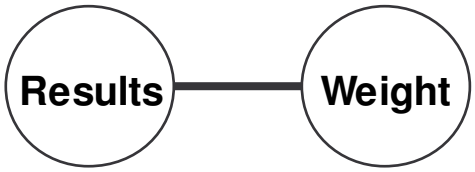
# Meta-analysis

**Combinability is a problem:**

A. Heterogeneity:
   - Variations in population.
   - Variations in interventions.
   - Variations in comparison.
   - Variation in outcomes.

B. Sample size.

C. Methodological quality.



# Meta-analysis

- When heterogeneity is considerable, be cautious:
  - In interpreting the results.
  - In trusting the combined results across all trials.
- Whenever heterogeneity is evident:
  - Try to investigate the reasons.
  - Modify the approach accordingly:
    - Subgroup analysis.

# Results of meta-analysis
(the forest plot)

Review title: New review
Comparison title: Comparison between treatment and control
Outcome: Mortality

| Study | Treatment n/N | Control n/N | OR (RR) (Fixed) 95% CI | Weight (%) | OR (fixed) 95% CI |
|---|---|---|---|---|---|
| Blue | 10/50 | 13/50 | | 12.6 | 0.71 [0.28, 1.82] |
| Green | 15/70 | 22/80 | | 19.54 | 0.72 [0.34, 1.53] |
| Red | 29/100 | 33/100 | | 28.38 | 0.83 [0.46, 1.51] |
| Yellow | 33/155 | 43/167 | | 39.47 | 0.80 [0.54, 1.18] |
| Total (95%CI) | 375 | 397 | | 100.00 | 0.77 [0.56, 1.07] |

Total events: 87 (treatment), 111 (control)

Test for heterogeneity: $Chi^2 = 0.12$, df = 3 (P = 0.99), $I^2 = 0\%$
Test for overall effect Z = 1.54 (P = 0.12)

0.1 0.2 0.5 1 2 5 10
Favors treatment Favors control

## Statistical significance & Clinical significance

P value is the probability of chance

The same meaning in all statistics

It means statistical significance

Statistical significance ✗ Clinical significance

Statistical significance ✗ Research significance