Delfini Pearls
Correlation Analysis

Healthcare Information & Decision Equation: **Information➔Decision ➔Action➔Outcome**
Is it true➔Is it useful ➔Is it usable?

Correlation analysis is a mechanism to analyze how different variables relate to each other.

Types of Variables: statistical tests are chosen based on type of variables; the 4 main types are—

- **Nominal** (named categories without any measurable scale such as ethnic groups)
- **Dichotomous** or binary (two mutually exclusive categories resulting in "either this or that" such as "death" or "survival")
- **Ordinal** or ranked (three or more variables that can be "ordered" or ranked such as good/better/best or satisfied/neutral/unsatisfied)
- **Continuous** (can be anywhere along a continuum, e.g., blood glucose readings)
- Variables under study are also classed as "**dependent**" (the outcome under study) or "**independent**" (all others that might affect the "dependent" variable)

Correlation Analysis includes the following analysis categories—

Analysis Type	Purpose	Analysis Methods
Univariate Analysis	Methods for analyzing data on a single variable	Frequency distribution
Bivariate Analysis	Assess relationship of two variables	Correlation analysis Linear regression
Multivariable Analysis	Assess relationship of multiple variables to a single outcome	Multiple regression Proportional hazards
Multivariate Analysis	Assess relationship of multiple variables to multiple outcomes	(not reviewed)

Sometimes "-variate" and "-variable" get misapplied

Pearson Correlation Coefficient

- Commonly used correlation analysis method
- Extent of the linear relationship (how independent and dependent variables change together) is calculated for the two variables by calculating the **Pearson correlation coefficient,** referred to as the **r value**
- Pearson correlation coefficient (r) is frequently used when both variables are continuous to show **how variables change together**, e.g., salt intake and blood pressure
- The *correlation coefficient* has a range of possible values from -1 to +1
- 0 indicates no relationship between the dependent and independent variables
- Positive correlation coefficients indicate that as the value of the independent variable increases, the value of the dependent variable increases
- Negative correlation coefficients indicate that as the value of the independent variable increases, the value of the dependent variable decreases
- r^2 (square of the correlation coefficient) represents the proportion of variation in y (on an x-y plot) explained by x (or vice versa)
    - Example: "…A moderately strong inverse criterion validity correlation (Pearson correlation coefficient = -0.68) was shown when preoperative patients were administered both the AOFAS and FFI questionnaires, and the resultant scores were compared."

Critical Appraisal Considerations

- It may be incorrect to draw cause/effect conclusions from correlations
    - Example: Height/weight are correlated, but height does not cause weight