EBDM

Definitions

Evidence Based Decision Making: Clinical decisions by integrating the best available research evidence

Epidemiology: The study of the distribution and determinants of heath and disease in populations

Biostatistics: The application of statistical methods to biological health and medical data

Diagnostic Efficacy: The accuracy and usefulness of a diagnostic test

Risk: Probability of developing the diseases over a specific time period

Levels of Prevention

Level	Definition	Example
Primary	Prevent disease before it occurs	Vaccinations, lifestyle counseling
Secondary	Detect disease early to halt or slow it	Pap smear, mammogram
Tertiary	Reduce impact of an established disease	Rehabilitation, physical therapy, chronic disease management

Core Measures

Prevalence

$$\text{Point} = \frac{\text{Existing cases at a specific time}}{\text{Population at that time}}$$
$$\text{Period} = \frac{\text{Existing cases during a period}}{\text{Population during that period}}$$

Incidence Rate

$$\text{Cumulative} = \frac{\text{New cases in a time period}}{\text{Population at risk at start of period}}$$
$$\text{Density} = \frac{\text{New cases}}{\sum(\text{time each person is at risk})}$$

Equations

$$\text{Prevalence} = \frac{\#\text{ subjects with disease}}{\#\text{ subjects who could have disease}}$$

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN}$$

$$\text{Sensitivity} = \frac{TP}{TP + FN} = P(\text{Positive Test} \mid \text{Disease})$$

$$\text{Specificity} = \frac{TN}{TN + FP} = P(\text{Negative Test} \mid \text{Healthy})$$

$$\text{False Negative Rate} = 1 - \text{Sensitivity}$$

$$\text{False Positive Rate} = 1 - \text{Specificity}$$

Predictive Values

Positive Predictive Value (PPV)

$PPV = P(\text{Disease} \mid \text{Positive Test}) = \frac{TP}{TP + FP}$

Effect of Prevalence: Increases with higher prevalence.

Effect of Threshold: Raising threshold increases specificity, reduces FP, increases PPV.

Negative Predictive Value (NPV)

$NPV = P(\text{Healthy} \mid \text{Negative Test}) = \frac{TN}{TN + FN}$

Effect of Prevalence: Decreases with higher prevalence.

Effect of Threshold: Lowering threshold increases sensitivity, reduces FN, increases NPV.

1 - NPV

$1 - NPV = P(\text{Disease} \mid \text{Negative Test}) = \frac{FN}{TN + FN}$

Interpretation: False-negative probability.

Testing Methods

SPin vs SNout

SPin: Specific test to rule in disease

SNout: Sensitive test to rule out disease

Parallel vs Serial

Serial: Tests done one after another; paired with SPin

Parallel: Tests done simultaneously; paired with SNout

Likelihood Ratio

Positive Likelihood Ratio (LR+)

$PPV = P(\text{Disease} \mid \text{Positive Test}) = \frac{TP}{TP + FP}$

Effect of Prevalence: Increases with higher prevalence.

Effect of Threshold: Raising threshold increases specificity, reduces FP, increases PPV.

Negative Predictive Value (NPV)

$NPV = P(\text{Healthy} \mid \text{Negative Test}) = \frac{TN}{TN + FN}$

Effect of Prevalence: Decreases with higher prevalence.

Effect of Threshold: Lowering threshold increases sensitivity, reduces FN, increases NPV.

Odds and Risks

Risk Ratio: $\frac{\text{P(Getting Disease} \mid \text{Exposure)}}{\text{P(Getting Disease} \mid \text{No Exposure)}}$

Odds Ratio: $\frac{\text{Odds of (Getting Disease} \mid \text{Exposure)}}{\text{Odds of (Getting Disease} \mid \text{No Exposure)}}$

Attributable Risk: Risk of (Getting Disease | Exposure) − Risk of (Getting Disease | No Exposure)

Attributable Risk Reduction: Risk of (Getting Disease | Control) − Risk of (Getting Disease | Treatment)

Attributable Risk Proportion: $\frac{R_{\text{exposed}} - R_{\text{unexposed}}}{R_{\text{exposed}}}$

Number Needed to Treat/Harm: $\frac{1}{\text{AR(R)}}$

Rates

Case Fatality Rate: $\frac{R_{\text{exposed}} - R_{\text{unexposed}}}{R_{\text{exposed}}}$

Disease Morbidity Rate: $\frac{R_{\text{exposed}} - R_{\text{unexposed}}}{R_{\text{exposed}}}$

NNS PSR Historical Study

Validity

Sampling

Population: Group of people you are interested in studying

Sample: Subset of the population to collect data from

Sample Frame: List or database the sample is taken from

Sampling Factors

Procedure: How the sample was selected

Size: The size of the sample

Participation Rate: How many people of the sample participated

Validity

External Validity: The degree to which your study as being generalized to other situations, peoples, and settings

Internal Validity: The degree to which your study shows a true cause and effect relationship

Population Validity: The degree your sample can be generalized to a larger population

Ecological Validity: The degree you study can be generalized to real-world settings

Statistical Significance