COMMUNITY MEDICINE

Epidemiology Activity – Third Week

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Topic	Description	Formula and key terms	Application/Interpretation
Measures of Association	Epidemiological measures to quantify relationships between exposure and disease	Chi-Square , Relative Risk (RR) , Odds Ratio (OR) , Attributable Risk (AR)	Quantify association strength and impact between risk factors and health outcomes
2*2 Table (Contingency Table)	Organizes data by disease (yes/no) and exposure (yes/no)	-	Sets framework for calculating Chi-square , RR , OR , AR.
Cells in 2*2 Table	Data layout for interpreting associations between exposure & disease	a: Exposed & Diseased b: Exposed & Not-Diseased c: Not Exposed & Diseased d: Not Exposed & Not Diseased	Organizes data for epidemiological calculations
Marginal Totals	Total sum for exposed and diseased / non- diseased categories	a+b : Total Exposed c+d : Total Non-Exposed a+c: Total Diseased b+d : Total Non-Diseased a+b+c+d : Grand Total	Provides data for calculating incidence and risk in RR and OR formulas
Chi-Square	Tests association between two categorical variables	Usually calculated using software like SPSS or excel $\chi^2 = n(ad-bc)-(n/2)^2/(a+b)(a+c)(c+d)(b+d)$	Indicates if there is a significant association. If $p<0.05$, association is significant. Tells only whether there is association. It doesn't tell us how strong it is
Relative Risk (RR)	Measure risk of developing disease in exposed groups relative to non-exposed in cohort studies (Estimation of disease risk with exposure / Strength of association)	RR = [a/(a+b)] / [c/(c+d)]	RR=1 : No association RR>1 : Positive association (higher risk in exposed group) RR<1 : Protective effect
RR in Cohort Study	Relative Risk can be obtained from cohort study . In a Cohort study, we calculate Incidence	Incidence rates: Risk among exposed Risk among non-exposed	-
Interpretation of RR	Explain significance of RR values	RR>3 High association RR (1.5-2.9) Moderate association RR (1.4-1.2) Weak associations RR=1 No association RR<1 Negative association	Quantifies strength of relationship between exposure and disease for example RR=2 means risk of exposed = 2 * risk of non-exposed

Topic	Description	Formulas and key terms	Application
Odds ratio (OR)	Estimates strength of association for case control studies	OR=ad/bc	• Similar interpretation to RR • used when disease is rare and cases/controls represent general population
Conditions for RR estimated by OR	When OR is a reliable estimate of RR	• Controls represent general population • selected cases represent all cases • disease is rare	Ensures OR approximates RR accurately
Attributable risk (AR) (Risk difference)	Measure how much of the risk (in the exposed) is due to the exposure	AR= a/a+b –c/c+d	Quantifies additional risk attributable to exposure
Attributable risk percent (AR%)	Percentage of disease among exposed group due to exposure	AR%=risk in exposed – risk in non-exposed/ risk in exposed *100% AR%= a/a+b –c/c+d *100%	Indicates how much of disease in exposed group is due to the exposure, e.g. if smoking is 90% responsible for lung cancer in smokers
Possible outcomes in the relationship between exposure & disease	Define possible relationships between exposure and disease	• No association: RR =1, AR=0 • Positive association: RR>1, AR>0 • Negative association: 0<RR<1, AR<0	• Positive association: exposure increases disease risk • negative association: exposure decreases disease risk
Risk factors	Any factor that increases disease occurrence	RR > 1 : positive association	Contributes to disease risk e.g. smoking for lung cancer
Preventive factors	Any factor that decreases disease occurrence	RR <1 : negative association	Protective effect against disease, e.g. regular exercise reducing heart disease risk