Concept	Definition	Formula	Application	Interpretation	Conditions/Notes
Chi-Square Test	Tests for an association between two categorical variables in cross-sectional studies.	$\chi^2 = \frac{n(ad-bc)^2}{(a+b)(a+c)(c+d)(b+d)}$	Cross-sectional studies to check if there's a significant association between risk factor and disease.	If calculated χ^2 > critical value or $p < 0.05$, association is significant.	Does not measure strength of association. Usually calculated with software (e.g., SPSS, Excel).
Relative Risk (RR) *(strong of association)*	Measures the risk of developing a disease in an exposed group compared to a non-exposed group. Used to show association strength.	$RR = \frac{a/(a+b)}{c/(c+d)}$	Cohort studies where incidence can be calculated.	- $RR = 1$: No association. - $RR > 1$: Positive association (higher risk). - $RR < 1$: Negative association (protective effect). **Strength of Association:** - High: $RR > 3$ - Moderate: $1.5 \le RR \le 2.9$ - Weak: $1.2 \le RR \le 1.4$	Best for cohort studies with incidence data. *What does 2X mean? Risk is exposed = 2X risk Non exposed*
Odds Ratio (OR)	Estimates the strength of association between a risk factor and an outcome. Often used when RR cannot be calculated. *→ Is the cross product of the entries in table.*	$OR = \frac{(a/c)}{(b/d)} = \frac{ad}{bc}$ ⇒ $\frac{odds\ of\ exposure\ among\ diseased}{Odds\ of\ exposure\ among\ non-diseased}$ - *what does OR 8 mean? Exposed people have 8 times the odds of developing the disease compared to those not exposed.*	Case-control studies, where RR can't be directly calculated.	- $OR = 1$: No association. - $OR > 1$: Positive association. - $OR < 1$: Negative association (protective). Interpretation is similar to RR, especially for rare diseases.	Best estimate of RR if: ① Controls represent the general population. ② Cases are representative of all cases. ③ Disease is rare.
Attributable Risk (AR)	Quantifies the excess risk in the exposed group that can be attributed to the exposure. Also known as the risk difference.	$AR = \frac{a}{a+b} - \frac{c}{c+d}$ ⇒ (risk incidence exposed - risk incidence in non exposed)	Cohort studies to estimate how much risk can be attributed to a particular exposure.	- $AR = 0$: No association. - $AR > 0$: Positive association. - $AR < 0$: Negative association.	Indicates the risk that could be eliminated if exposure were removed. *remove the risk of the disease that occured due to other causes.*
Attributable Risk Percent (AR%)	The proportion of disease among exposed individuals that is due to the exposure. *attributable*	$AR\% = \left(\frac{Risk\ in\ Exposed - Risk\ in\ Non-Exposed}{Risk\ in\ Exposed}\right) \times 100\%$	Evaluates the potential impact of reducing exposure in a cohort. *the amount might be eliminated if controlled or eliminated*	Shows what percentage of the disease could theoretically be prevented by eliminating the exposure.	Example: If AR% is 90% for smoking in lung cancer, then 90% of lung cancer cases in smokers are due to smoking.
Possible Outcomes (Exposure-Disease Relationship)	Different types of associations between exposure and disease.	Not applicable.	For interpreting study results in epidemiology.	1. **No Association**: $RR = 1$, $AR = 0$ 2. **Positive Association**: $RR > 1$, $AR > 0$ 3. **Negative Association**: $RR < 1$ [protective fraction], $AR < 0$	- A **risk factor** has $RR > 1$ and is associated with higher disease risk. - A **preventive factor** has $RR < 1$ and is associated with lower disease risk.

Risk factor: any factor ⊕ associated with a disease ($RR > 1$). It is associated with increased occurance of a disease.

Preventive Factor: any factor ⊖ associated with a disease ($RR < 1$). It is associated with decreased occurance of a disease.

Risk and Preventive factors may (not) be amenable to change. (eg. smoking, age)