POPH90014

Epidemiology 1

Contents

Steps in Measuring Disease Frequency:

1. Define the population of interest
2. Define the outcome of interest
3. Define the question to be addressed
4. Determine the measure of disease frequency that best answers the question given the outcome and the population

Types of Populations

- Dynamic (open, transient membership, eg. resident of VIC)
- Fixed (closed, permanent membership, eg. HIV patients)

] Type of population affects type of measure and study.

Measures of Disease Frequency

Name of Measure	What it measures	For what population	Issues it addresses
****Prevalence**	Proportion of people with the outcome at a given time. *Prevailing* diseases.	Dynamic and Fixed	What resources are needed to manage diabetes?
Incidence Proportion	Proportion of people who develop outcome in a specific length of time	Fixed	What is the risk of food poisoning after eating contaminated food?
Incidence Rate	How quickly people develop outcome in a population	Dynamic and Fixed	Surveillance Evaluation of public health interventions

**Prevalence is not as good for identifying risk factors because cases are identified by having a disease for a long duration, and factors that affect this duration may also affect prevalence.

Limitations of IP

- Assumes that everyone is observed for the same length of time
- Loss to follow-up means that we don't know if participants would have developed the outcome in the specified period
- Calculations are often too conservative
- The longer the period of observation, the less accurate the calculation

Differences between Incidence Rate and Incidence Proportion

- Time is part of the formula in IR
- IR allows for different lengths of follow-up, is not affected by loss to follow-up
- IR can be used for fixed *and* dynamic populations, whereas IP is only fixed
- IR has units, IP does not
- IR is not as intuitive, IP has meaning for an individual

Why should we compare disease frequencies?

- To measure the association between an exposure and an outcome
- To identify risk factors for an outcome
- To assess the public health impact of an exposure
- To evaluate public health intervention

2x2 Table for Incidence Proportion

	Outcome (disease)		
Exposure	**Yes**	**No**	**Total**
Yes	a	b	a+b
No	c	d	c+d

IP exposed (IP_e) = $\frac{a}{a+b}$

IP non-exposed (IP_0) = $\frac{c}{c+d}$

Risk Ratio (RR) = $IP_e \div IP_0$

Risk Difference (RD) = $IP_e - IP_0$

Rate Ratio (RR) = $IR_e \div IR_0$

Rate Difference (RD) = $IR_e - IR_0$

Second value (the one being subtracted/the denominator) is the **reference. When there is a natural "unexposed" category, use this as the reference. When there is no natural exposed or unexposed category, the category with the lower rate/risk is often chosen as the reference.

Bigger relative effect (**risk ratio**) -> Stronger association
Bigger absolute effect (**risk difference**) -> Bigger public health impact

Interpretation of Rate Ratio
For people aged 40-44, the male suicide rate was 2.8 times higher than the female rate. (RR=2.8, female reference)

Interpretation of Rate Difference
For this age group, males had a suicide rate 16.3 per 100,000 person-years higher than females. If males had the same suicide rates as females, they would have 16 fewer deaths per 100,000 person-years. (RD=16.3 per 100,000 person-years, female reference).

Prevalence Ratio (PR) = $P_e \div P_0$

Prevalence Difference (PD) = $P_e - P_0$

Odds Ratio (OR)

$$\frac{Odds\ of\ exposure\ if\ have\ outcome}{Odds\ of\ exposure\ if\ no\ outcome} = \frac{a \times d}{b \times c}$$

Relative vs. Absolute Measures of Association

	Ratio (relative)	**Difference (absolute)**
Method of Calculation	Division	Subtraction
Used to identify risk factors?	Yes	No
Measures strength of association?	Yes	No
Measures public impact of exposure?	No	Yes

Attributable Fraction = Fraction of disease in the exposed population caused by the exposure.

Population Attributable Fraction: Fraction of disease in whole population caused by exposure.