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Epidemiology

What is Epidemiology?

study of disease and health in human populations.
-Here disease may be any adverse health outcome such as pre-term birth, it may not necessarily be a disease such as cancer.

Goals of Epidemiological Research

-Describe the health status of populations
-Explain the etiology of diseases
-Predict the number of disease occurrences and the distribution of health status
-Control the distributions of disease in the population

Components of Epidemiology

Measure disease frequency
– Quantify disease
•***Assess distribution of disease***
– Who is getting disease?
– Where is disease occurring?
– When is disease occurring?
➔Formulation of hypotheses concerning causal and preventive factors
Identify determinants of disease
– Hypotheses are tested using epidemiologic studies

OBSERVATIONAL STUDIES

Non-experimental
there is no individual intervention
Individuals can be observed prospectively, retrospectively, or currently (i.e. cross-sectional)

Descriptive studies

Case Report

-Detailed presentation of a single case or handful of cases(One case of unusual findings)
-Generally report a new or unique finding

Case Series

-Experience of a group of patients with a similar diagnosis
-May be only realistic design for rare disorders

Advantages

• Useful for hypothesis generation
• Informative for very rare disease with few established risk factors
• Characterizes averages for disorder
• Disadvantages
• Cannot study cause and effect relationships • Cannot assess disease frequency

Descriptive Epidemiology Study
Population-based cases with denominator

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Analytical studies

Cross-sectional studies

(at a single point in time)
Often used to study conditions that are relatively frequent with long duration of expression (nonfatal, chronic conditions)
• It measures prevalence, not incidence of disease
• Example: community surveys
Not suitable for studying rare or highly fatal diseases or a disease with short duration of expression
Disadvantages

1. Weakest observational design, (it measures prevalence, not incidence of disease). Prevalent cases are survivors
2. The temporal sequence of exposure and effect may be difficult or impossible to determine
3. Usually don't know when disease occurred
4. Rare events a problem. Quickly emerging diseases are also problem.

It measures prevalence

Case control studies

-Selection of cases (disease) and controls (no disease) based on disease status
– Exposure status is unknown

ODDS RATIO (OR)

Odds of exposure = number exposed /number unexposed

The odds of exposure for cases are **** times the odds of exposure for controls.

Those with CHD are **** times more likely to be smokers than those without CHD
or
Those with CHD are ****% more likely to be smokers than those without CHD

	OR<1	OR=1	OR>1
Odds comparison between cases and controls	Odds of exposure for cases are less than the odds of exposure for controls	Odds of exposure are equal among cases and controls	Odds of exposure for cases are greater than the odds of exposure for controls
Exposure as a risk factor for the disease?	Exposure reduces disease risk (Protective factor)	Particular exposure is not a risk factor	Exposure increases disease risk (Risk factor)

COMING SOOADVANTAGES OF CASE-CONTROL STUDIES

1. Quick and easy to complete, cost effective
2. Most efficient design for rare diseases
3. Usually requires a smaller study population than a cohort study

DISADVANTAGES OF CASE-CONTROL STUDIES

1. Uncertainty of exposure-disease time relationship
2. Inability to provide a direct estimate of risk
3. Not efficient for studying rare exposures
4. Subject to biases (recall & selection bias)

Cohort studies

longitudinal/Prospective studies /Forward looking study I Incidence study
starts with people free of disease
assesses exposure at "baseline"
assesses disease status at "follow up"
When do use it?
When there is good evidence of exposure and disease.
When exposure is rare but incidence of disease is higher among exposed
When follow-up is easy, cohort is stable • When ample funds are available
Follow-up: To obtain data about outcome to be determined (morbidity or death)

Incidence rate
• Incidence among exposed = a a+b
• Incidence among non-exposed = c+d

• Relative Risk

$$RR = \frac{\text{incidence of disease among exposed}}{\text{Incidence of disease among non-exposed}} = \frac{a/a+b}{c/c+d}$$

(lung cancer is **** times more common among smokers than non smokers)

Strengths (advantages)
1. We can find out incidence rate and risk
2. More than one disease related to single exposure
3. can establish cause -effect
4.good when exposure is rare
5.minimizes selection and information bias

Weaknesses (disadvantages)
1. losses to follow-up
2. often requires large sample
3.ineffective for rare diseases
4.long time to complete
5. expensive
6. Ethical issues