Epidemiology Class Assignment.
Cluster B16

Name
Pratjot Kaur Sehmi H31/30429/2014
Elvis Muriithi Kavaya H31/2567/2014

Q1) Define epidemiology and identify important elements in its definition. Give an example for each.

It is the study of the distribution and determinants of health related states or events in specified populations and the application of this study to control health problems.

* Distribution falls under descriptive epidemiology, this answers questions related to Who, What, When and Where?
* Determinants are factors that influence the outcome or the occurence of health related events. They can be risk factors or protective factors = Smoking, Exercise
* Health related events are the outcomes e.g disease, injuries and birth defects.
* Specified Population - Refers to target groups e.g no. of people exposed to a specific infectious agent in a community
* Application → Epidemiology generates knowledge from analytic and descriptive studies to control and prevent diseases in a community.

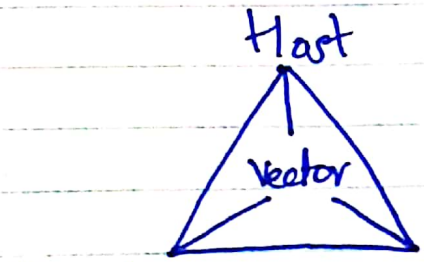
2) Epidemiology has several uses. List 5 of them.

- Investigate etiology of a disease and modes of transmission
- Determine the extent of disease problems in the community
- Study the natural history of disease and prognosis of a dise
- Evaluate both the existing and new preventive and therapeu measures of health care delivery
- Provide a foundation for public policy and regulatory decisions

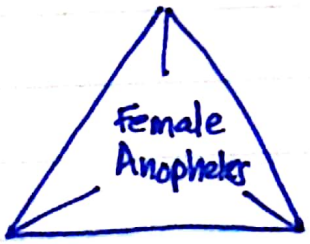
Q3. Level of Prevention

a) Secondary
b) Tertiary
c) Primary
d) Tertiary
e) Tertiary
f) Primary

Q4) Epidemiological Triad.



⇓ Example for Malaria



Plasmodium falciparum.

Tropical Areas

5 Rates of becoming sick.

a) People who ate:

* People who got sick / Total at risk.

Herring → 200/1000 = 0.2

Chicken ⇒ 650/1000 = 0.65

Spinach = 200/1000 = 0.2

Oysters = 300/1000 = 0.3

Chocolate Mousse = 600/1000 = 0.6

People who did not eat

* People who got sick / Total no. of people at risk

= 100/1000 = 0.1

= 100/1000 = 0.1

= 500/1000 = 0.5

= 400/1000 = 0.4

= 450/1000 = 0.45.

Name of calculate rate = Incidence risk.
Attack rate.

b) Measures of Strength of association.

* Risk Ratio.

Herring = 0.2/0.1 = 2

Spinach = 0.2/0.5 = 0.4

Chocolate Mousse = 0.6/0.45 = 1.33

Chicken = 0.65/0.1 = 6.5

Oysters = 0.3/0.4 = 0.75

* Herring → People who ate herring have roughly 2 times higher risk of developing gastritis than those who did not

* Chicken = People who ate chicken have 6.5 times higher risk of developing gastritis than those who did not.

* Spinach = People who ate spinach have a 0.4 times lower risk of developing gastritis than those who did not

* Oysters = People who ate Oysters have a 0.75 times lower risk of developing gastritis than those who did not

* Chocolate Mousse = People who ate chocolate mousse have a 1.3 times higher risk of developing gastritis than those who did not.

c) Food most likely to have caused gastritis.
Chicken
Reason: People who ate chicken have a 6.5 times higher risk of developing gastritis than those who did not.

6) With examples, differentiate following measures
a) Prevalence and Incidence.
Prevalence = Proportions of persons in a defined population that have outcome of interest (existing cases) at a defined instant in time / specified time period.
Incidence = Proportions of persons in a defined population that develop an outcome of interest (new cases) at a defined instant in time / specified time

E.g ⇒ Three-hundred people in Kiambu county developed pneumonia between January and March 2019 (Incidence)
Nineteen people in Kiambu county had pneumonia on 22nd February 2019 (Point Prevalence)

b) Cumulative Incidence and Incidence Density

Cumulative incidence = Probability of occurence of disease in a disease free population during a specified time period
e.g 150 out of 1,000,000 men developed cancer of the prostate in Portugal in 1976

Incidence Density = Number of new cases of disease in a population per person time risk
e.g Rate of pneumonia in Kiambu was 1.8 episodes per child-year.

c) Attack rate and Secondary Attack rate.

Attack rate = Defined as number of new cases occuring during duration of outbreak among a population at risk at the start of outbreak
e.g 500 out of 100,000 developing pneumonia in Kiambu County

Secondary Attack Rate = Defined as proportion of those exposed to the primary case that develop disease as a result of exposure

e.g

d) Relative Risk and Odds Ratio.

Relative Risk = Ratio of the incidence risk of disease in exposed group to risk of disease in unexposed group

e.g People who ate chicken have 6.5 times higher risk of developing gastritis than those who did not.

Odds Ratio = It is the odds of disease in exposed group divided by odds disease in the unexposed group.

e.g Odds of developing gastritis is 2.25 times higher in those who ate herring than in those who did not.

7) Relationship between Incidence and Prevalence for a Stable disease in the population.

For a Stable disease the incidence is equal to the prevalence

e.g For new cases of Polio, the new cases become the existing cases.

8) Using Examples, Differentiate between the following

a) Observational and Experimental Study designs.

Observational Studies

They collect information on events over which we have no control over.

E.g Prevalence of smoking tobacco in a population.

Experimental Studies.

Studies in which the investigator deliberately allocates the exposure to individuals or communities (not harmful exposures)

E.g Administration of Minoxidal stimulates hair growth in bald men.

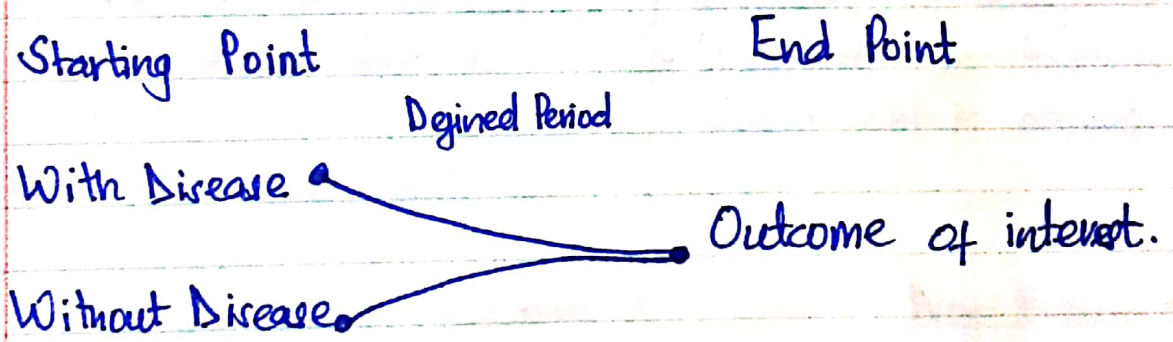
b) Analytic and Descriptive Studies.

Analytic ⇒ The information about both outcome and exposure is measured at the same time (simultaneously)
e.g A study measuring lung cancer and risk factors such as tobacco smoking, and genetics

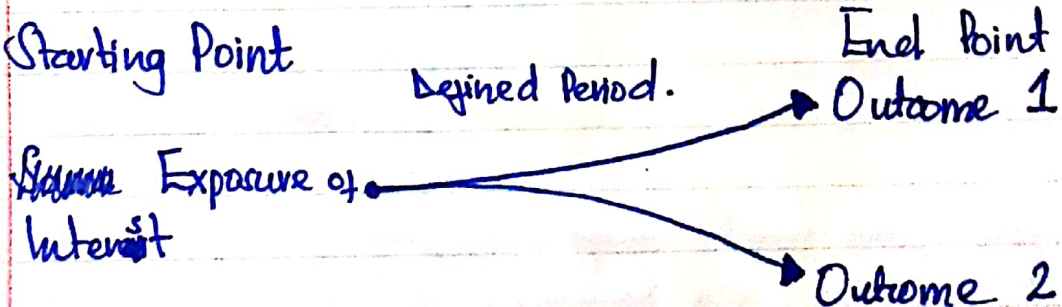
Descriptive = The information about outcome or exposure (but not both) is collected from individuals
e.g Prevalence of smoking tobacco in a population

9) Illustrate diagrammatically the difference between case control and analytic cohort designs.

Case Control



Cohort.



b) Cases of Disease 500 Factor Present 400
Control 500 100.

a) Study Design = Case Control.

b) Absolute risk of disease in people with the factor

$$\text{Absolute risk} = \frac{\text{No. of events occuring in a group}}{\text{Total No. in a group}}$$

$$= \frac{500}{1000} \times 100 = 50\%.$$

c) Advantages and Disadvantages.

Advantages	Disadvantages.
- Relatively cheap + quick	x Prone to selection + information bias
- Usefel for rare diseases + diseases of long latency	x Temporal sequence might be absent especially in retrospective studies
- Can study multiple risk factors	x Unsuitable for studying rare exposure
- Can test hypotheses	x Cannot obtain estimate of incidence.

	Disease X	Non-Diseased.
ii) Smokers	112	176
Non-Smokers	88	224

a) Study Design ⇒ Cohort Study

b) Advantages and Disadvantages.

Advantages

✓ Exposure is measured temporally before disease onset - No reverse causality
✓ Rare exposures can be examined e.g exposure to vinyl chloride.
✓ Multiple outcomes can be studied for any one exposure.
✓ Useful for testing hypotheses.

Disadvantages.
✓ Losses to follow-up are commonly especially for long follow-ups
✓ High monetary cost
✓ Time consuming

c) Measures of disease occurence.
Odds ⇒ i) Smokers $= \frac{112}{176} = 0.64$

ii) Non-Smokers $= \frac{88}{224} = 0.39.$

d) Measure of association.

Odds Ratio $= \frac{0.64}{0.39} = 1.64$

12) Jacob's Study.
a) Study Design ⇒ ~~Cohort~~ Analytic Observational Study
The information about both outcome (Diabetes) and exposure (Lifestyle) is measured at the same time.

b) Measure of Disease occurence that can be determined??
Proportion e.g Prevalence.

c) Advantages and Disadvantages.

Advantages.	Disadvantages
✓ Cheap and Easy to conduct	✓ Reverse causality
✓ Take only a short time	

13) Screening Test for Lyme

Test Result		With Disease	Without Disease
	Positive	35	24
	Negative	6	1924.

a) Calculate and interpret the following.

i) Measures of validity

$$\text{Sensitivity} = \frac{\text{True Positives}}{\text{True Positives} + \text{False Negatives}}$$

$$= \frac{35}{41} = 0.76 = 76\%$$

$$\text{Specificity} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False}}$$

$$= \frac{1924}{1948} = 0.99 = 99\%.$$

ii) Predictive Values

PPV = Positive Predictive Value

$$\text{PPV} = \frac{\text{No. of true positives.}}{\text{No. of true positives} + \text{No. of false positives}}$$

$$= \frac{35}{59} = 0.59. = 59\%.$$

Negative Predictive Value (NPV)

$$\text{NPV} = \frac{\text{No. of true -ves}}{\text{No. of true -ves} + \text{No. of false -ves}}$$

$$= \frac{1924}{1930} = 0.997 = 99.7\%.$$