


HSC Biology

Core 3 - Search for Better Health

Focus 6

 Epidemiological studies involve the collection and careful statistical analysis of large quantities of data. Such studies assist the causal identification of non-infectious diseases.

Identify and Describe the main features of epidemiology using lung cancer as an example.

- Epidemiology:
 - The science of prevention.
 - Based on systematic & on going collection, collation, analysis & interpretation of data.
 - Study of diseases affecting people.
 - How often they occur in different populations & why.
 - Identifies trends & causes of disease within a population.
 - Include infectious & non-infectious diseases.

 - Involves **large groups of people**.
 - Large amounts of information & data collected & analysed statistically.

 - Cause & effect relationships difficult to clarify in humans.
 - All features of individual and related features must be identified.

 - Studies help distinguish between factors causing a disease & factors that are chance associations.

- Lung cancer (l.c.):
 - Suspected prior to 1900, tobacco smoking caused ill-health.
 - Since 1950s:
 - Epidemiologists had great success with lung cancer.
 - People who develop l.c.
 - More likely to smoke.
 - More likely to have smoked.
 - **83%** l.c. associated with / caused by smoking.
 - Epidemiological studies shown correlation with;
 - Number of cigarettes smoked / day.
 - Early starting age.
 - Risk of getting l.c.
 - Passive smoking linked to 3000 l.c. cases / year.
 - Pollution, radiation & asbestos also linked to l.c.
 - Early detection → increased survival rate.
 - Early detection & removal → 35-40% increased survival rate over 5yrs.
 - Otherwise 10%.
 - L.C. leading cause of death in men & women.
 - Peak incidence @ 55-65 y.o.a.
 - Occurs in 1/1000 people.
 - Increasing in women.

Identify causes of non-infectious disease using an example from each of the following categories:

- inherited diseases.
- nutritional deficiencies.
- environmental diseases.

- **Non-infectious diseases:**

- Not caused by pathogens.
- Not transferable from one organism to another.
- Wide variety of types → wide variety of causes.

- **Inherited diseases:**

- Genetically transmitted during reproduction.
 - Eg.** Cystic fibrosis, down syndrome, phenylketonuria (PKU), haemophilia, colour blindness, muscular dystrophy.
- Range from minor disorders (vision defects) to major diseases (thalassaemia).

- Often successfully treated by surgery, drugs or diet.
- Defective genes cannot currently be corrected.
 - Future techniques may allow this.

- Genetic counselling available to families with transferable disorder.
 - Investigates chances of offspring having condition.
- For already pregnant:
 - Amniocentesis & chorionic villus sampling.
 - Identify genetic abnormalities.
 - Removal of embryonic cells.
 - Cultured, chromosomes examined.
 - Abnormalities determined.

☀ Down syndrome:

- Caused by non-disjunction of chromosome 21 (47 instead of 46).
 - Results in trisomy 21.
 - Incomplete separation of specific chromosome pair during meiosis.
 - Chance of this occurring increases with age of mother.
- Symptoms of mental retardation are mild to severe.
 - Other signs:
 - Small, flat nose.
 - Skin folds at eye corners.
 - Protruding tongue.
 - Short neck, arms, fingers.
 - 40% have some form of heart defect.
- No cure for down syndrome, special education programs assist children.
- Pregnant women over 35 in Aust.
 - Can have amniocentesis / chorionic villus.
 - Determine defects, continue/abort pregnancy.

• Nutritional diseases (deficiency diseases):

- Lack of vital components in diet → a deficiency disease.

Vitamin	Functions	Deficiency Symptoms (Disease)
A (lipid soluble)	Growth, vision, healthy skin, mucous membranes.	Retarded growth, night blindness, dry skin, susceptible to infection.
B ₁ Thiamine (water soluble)	Growth, CHO metabolism, function of; heart, nerves, muscles.	Retarded growth, loss of appetite, neuritis, tiredness. (Beri-beri).
B ₂ (G) Riboflavin (water soluble)	Growth, healthy skin, CHO metabolism, function of eyes.	Retarded growth, inflamed tongue, premature ageing, dim vision, intolerance to light.
B ₆	Many cell functions.	Dermatitis, convulsions in

Pyridoxine (water soluble)		children.
B ₁₂ Cobalamine (water soluble)	Manufacture of r.b.cs.	Pernicious anaemia.
Niacin Nicotinamide (water soluble)	Growth, CHO metabolism, function of digestive system, function of nervous system.	Skin eruptions, smooth tongue, digestive upsets, nervous disorders. (Pellagra).
C Ascorbic acid (water soluble)	Growth, healthy gums, strong blood vessels.	Slow healing, sore gums, bruising. (Scurvy).
D (lipid soluble)	Growth, metabolism of; Ca & P, only needed in small children.	Soft bones, poor teeth. (Rickets).
E Tocopherol (lipid soluble)	Normal reproduction, thought to assist in blood oxygenation.	Unknown.
Protein	Growth, repair.	Tissue wasting, skin sores, fluid accumulation (oedema). (Kwashiorkor, marasmus).

🌸 Starvation:

- Symptoms such as;
 - Muscle, tissue wasting.
 - Loose skin.
 - Lower metabolic rate.
 - Swelling caused by accumulation of fluids.
- Adults last approx. 2mths without food.

- Anorexia Nervosa:
 - Psychiatric disease.
 - Deliberate under eating.

- **Environmental Diseases:**

- Many environmental factors cause disease.
 - Eg.** Allergens, stress, drugs, overcrowding & pollutants.
- Lifestyle also leads to disease.
 - Eg.** C.V. disease.

Environmental factors causing disease:

Category	Example
Mechanical trauma:	<ul style="list-style-type: none"> - Motor vehicle accidents. - Workplace accidents. - Sports injuries. - Violence injuries.
Temperature extremes:	<ul style="list-style-type: none"> - Burns. - Frostbite. - Hypothermia. - Heatstroke.
Irradiation:	<ul style="list-style-type: none"> - Sunburn. - Skin cancer. - Radiation sickness.
Chemicals:	<ul style="list-style-type: none"> - Alcoholism. - Heavy metal poisoning. - Nervous disorders. - Cancers.
Excessive noise:	<ul style="list-style-type: none"> - Hearing loss. - Sleeplessness. - Hypertension.
Bites & stings:	<ul style="list-style-type: none"> - Cardiopulmonary failure. - Respiratory failure. - Blood poisoning. - Tetanus. - Sores, lesions, ulcers.

- Drug abuse:
 - Drug:
 - Any chemical substance that affects the body's normal functioning.
 - Medicine:
 - Drugs used in prevention & treatment of disease.
 - Accidental or misuse of drugs over long periods of time can cause:
 - Tobacco:
 - Lung cancer.
 - Alcohol:
 - Alcoholism.
 - Narcotic drugs (heroin, cocaine):
 - Addiction, withdrawal symptoms.

Gather, Process and Analyse information to identify the cause and effect relationship of smoking and lung cancer.

- Epidemiologists determined that people who develop l.c., much more likely to have smoked.
 - 83% of l.c. associated with smoking.
 - Epidemiology also shows correlation between number of cigarettes smoked / day, starting age & risk of developing l.c.
 - Passive smoking associated with 3000 l.c. cases per year.
 - High pollution, radiation & asbestos also related to l.c.
 - May decrease validity of some results.

Identify Data Sources, Plan and Perform a first hand investigation or Gather information from secondary sources to Analyse and Present Information about the occurrence, symptoms, cause, treatment/management of a named non-infectious disease.

- **Cardiovascular Disease:**

- Occurrence & Cause:

- High occurrence in developed countries.

- Eg.** Australia.

- Heart & blood vessels cannot meet body's oxygen demand.

- Risk factors of atherosclerosis:

- High blood cholesterol.
 - Hypertension/high blood pressure.
 - Cigarette smoking.
 - Diabetes.

- Age.

- Sedentary syndrome.

- Stress.

- Rheumatic fever.

- Genetic inheritance.

- Age & high cholesterol diet causes fatty deposits (atheromas) in arteries.

- Become thick, hard, inelastic.

- Cannot cope with changes in blood pressure.

- Blood flow reduced to vital organs, muscles.

- Especially during exercise.

- Symptoms:

- Breathlessness.

- Chest pain.

- Abnormal heart beat.

- Swelling in legs & ankles.

- Treatment:

- Rest.
- Drug treatment.
 - Reduce blood pressure.
 - Lower cholesterol.
- Surgery.
 - Widen arteries (stenting).
 - Valve replacement surgery.
 - Electronic pacemaker (control heart rhythm).
 - Bypass operations.
 - Re-route blood, avoiding diseased vessels.

- Prevention:

- Keep fit.
- Exercise regularly.
- No smoking.
- Low cholesterol, low salt diet.
- Weight control.
- Stress management.

- Types of C.V. Disease:

- Coronary thrombosis.
 - 'Heart attack', artery becomes blocked.
- Arteriosclerosis.
 - Thickening, hardening of artery walls.
- Hypertension.
 - 'High blood pressure'.
- Stroke.
 - Failure to supply blood to the brain.
- Rheumatic heart disease.
 - Bacterial infection, leaving heart muscle & valves weakened.