The effect of lifestyle on some non-communicable diseases

4.2.2.6 · Biology · revision notes

How risk factors such as diet, smoking, lack of exercise and alcohol affect the incidence of non-communicable diseases, why a correlation is not the same as causation, and the human and financial costs of these diseases. Expect scatter-graph data questions, 'explain' questions on particular risk factors and 'discuss' questions on costs.

Key facts

- Risk factor = linked to an increased rate of a disease
- Obesity → type 2 diabetes
- Smoking → lung disease and lung cancer
- Carcinogens (including ionising radiation) → cancer
- Diet, smoking and lack of exercise → cardiovascular disease
- Alcohol → liver disease and effects on brain function
- Smoking and alcohol in pregnancy → harm to the unborn baby
- Correlation does not prove causation: a causal mechanism is needed

Notes

Risk factors

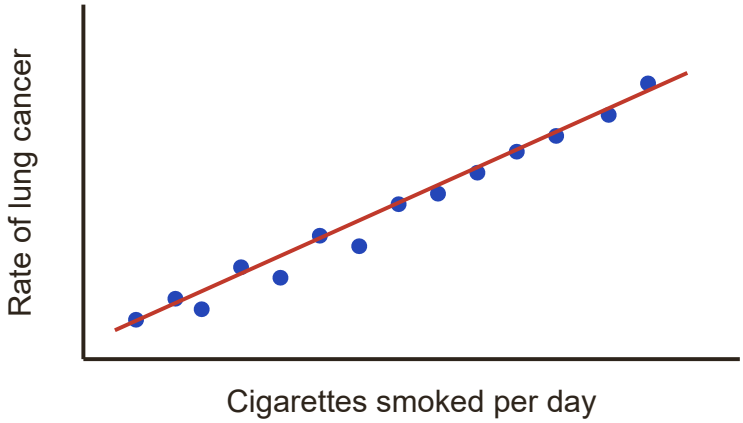
- A **risk factor** is linked to an increased rate of a disease. It can be an aspect of a person's **lifestyle** (e.g. smoking) or a **substance** in the person's body or environment (e.g. ionising radiation).
- A risk factor increases the chance of getting a disease. It does not mean the person will definitely get it.
- For some risk factors a **causal mechanism** has been proven, e.g. chemicals in tobacco smoke cause mutations that lead to lung cancer. For others only a correlation has been found so far.
- Many diseases are caused by the **interaction** of a number of factors.

Lifestyle factors and their effects

- **Cardiovascular disease**: a diet high in saturated fat raises blood cholesterol, and smoking damages blood vessels and raises blood pressure. Regular exercise lowers the risk.
- **Obesity** is a major risk factor for **type 2 diabetes**. It is often judged by **BMI** = mass in kg ÷ (height in m)^2 (the equation is given); 30 or more counts as obese.
- **Alcohol** damages liver cells (leading to liver disease) and affects brain function; heavy drinking over a long time can permanently damage the brain.
- **Smoking** causes lung diseases, such as bronchitis and emphysema, and lung cancer.
- In pregnancy, **smoking** reduces the oxygen reaching the fetus, which can cause low birth weight and premature birth. **Alcohol** can damage the baby's brain and growth.
- **Carcinogens**, including ionising radiation (e.g. X-rays and gamma rays), are risk factors for cancer.

Correlation, causation and costs

- A **scatter diagram** can show a correlation, e.g. as the number of cigarettes smoked per day increases, the rate of lung cancer increases (a positive correlation).



A positive correlation. It shows a link, but on its own it does not prove cause.

- A correlation does **not** prove that one factor causes the other: another factor could be responsible. Scientists need large, representative samples and a mechanism that explains the link.
- **Human cost**: pain, suffering, reduced quality of life and early death, which also affect families.
- **Financial cost**: to the individual (lost income), the community and nation (healthcare costs, lost working days) and globally, as these diseases become more common in many countries.

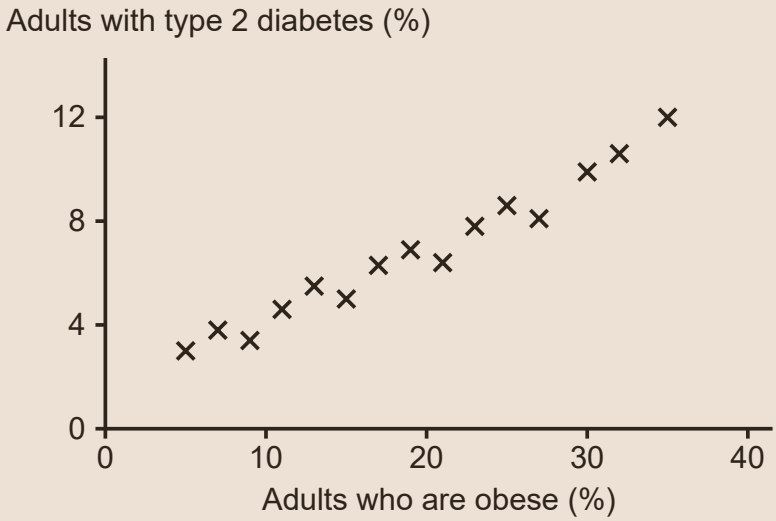
How to answer each type of question

Describe a correlation and say whether it proves cause

2 to 3 marks | Grade 6

1. Name the correlation: positive, negative or none.
2. Quote data: pick two points from the graph or table.
3. If asked about cause, say a correlation alone does not prove it and give a reason.

Example. A scientist plotted a scatter diagram for 15 countries. As the percentage of adults who are obese increased from 5% to 35%, the percentage of adults with type 2 diabetes increased from 3% to 12%.



Describe the relationship and state whether it proves that obesity causes type 2 diabetes.

Model answer. Positive correlation: as the percentage of obese adults increases, the percentage with type 2 diabetes increases (1). Use of data, e.g. 3% at 5% obesity rising to 12% at 35% obesity (1). It does not prove causation, because other factors such as diet or lack of exercise could affect both / a causal mechanism is needed (1).

Explain how a lifestyle factor increases disease risk

2 to 3 marks | Grade 5

1. Name what the factor does in the body.
2. Link each step with 'so' until you reach the disease.

Example. Explain why pregnant women are advised not to smoke.

Model answer. Chemicals in tobacco smoke (e.g. carbon monoxide) reduce the amount of oxygen the blood carries to the fetus (1), so the baby may grow less and have a low birth weight / be born early (1).

Discuss the human and financial costs of a disease 4 marks **Grade 5**

1. Split your answer into human costs and financial costs.
2. Cover different levels: the individual, family and community, the nation, the world.
3. Give specific examples rather than 'it costs a lot'.

Example. Type 2 diabetes is becoming more common in the UK.
Discuss the human and financial costs of type 2 diabetes.

Model answer. Human: the person may have a poorer quality of life, other health problems and an earlier death (1); family members may have to become carers (1). Financial: the individual may lose income if they cannot work (1); the NHS must pay for long-term treatment and monitoring, which costs the nation money / reduces money for other care (1).

Don't lose marks

- Saying a risk factor 'causes' a disease. It increases the chance (rate) of the disease.
- Saying a correlation proves that one thing causes another.
- Mixing up the targets, e.g. saying alcohol damages the lungs.
- Saying obesity is a risk factor for type 1 diabetes. It is a risk factor for type 2 diabetes.
- Describing a graph with no numbers when the question says 'use data'.

More tips

Memory tricks

- Link each factor to its target: smoking → lungs and heart; alcohol → liver and brain; obesity → type 2 diabetes; carcinogens → cancer; diet and exercise → heart and blood vessels.
- Correlation is not causation: ice cream sales and sunburn both rise in summer, but ice cream does not cause sunburn.
- Costs, 'Person, Place, Purse': the person and their family, the community and nation, and the money.

Exam technique

- 'Discuss' means give points about different aspects (human and financial; individual and national), not just one.
- When describing a scatter diagram, name the type of correlation and quote values.
- When asked whether data prove a cause, explain why not: other factors, sample size, the need for a mechanism.
- Link lifestyle factors to specific biology, e.g. saturated fat → cholesterol → fatty material in arteries, not just 'unhealthy'.

What each grade needs

What you need to be able to do, from the first marks up to the top grade.

Grade 3 **Define a risk factor**
A factor linked to an increased rate of a disease, such as part of a person's lifestyle or a substance in their body or environment.

Grade 4

Match risk factors to the diseases they affect

Diet, smoking and lack of exercise → cardiovascular disease; obesity → type 2 diabetes; alcohol → liver and brain; smoking → lung disease and lung cancer; carcinogens → cancer.

Grade 5

Describe effects of smoking and alcohol in pregnancy

Both can harm the unborn baby, e.g. smoking can cause low birth weight and alcohol can damage the baby's brain development.

Grade 5

Discuss human and financial costs of disease

Consider suffering and early death as well as treatment costs and lost work, for individuals, communities, nations and the world.

Grade 5

Explain how several factors combine to cause disease

Many diseases result from several risk factors interacting, e.g. smoking, poor diet and no exercise together raise heart disease risk.

Grade 6

Describe a correlation shown in a scatter diagram

Say whether the correlation is positive or negative and quote data from the graph.

Grade 7

Explain why correlation does not prove causation

Another factor might explain the link, so a causal mechanism is needed before saying one factor causes a disease.

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