Edexcel International AS Biology

Your notes

Diet & Health

Contents

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CVD Risk Factors

- There are many **lifestyle factors** that can **increase the risk of cardiovascular disease (CVD)**
  - CVD is a general term for conditions affecting the heart and blood vessels
  - It is usually associated with
    - **Atherosclerosis**; the formation of hard plaques in the artery lining
    - **Thrombosis**; the formation of blood clots in the arteries
- **Risk factors** are factors that can be linked to an **increased risk of a disease**
  - Exposure to a risk factor doesn't guarantee that an individual will suffer a disease, e.g. a person who smokes regularly isn't guaranteed to develop lung cancer but their risk compared to someone who doesn't smoke is much higher
  - Certain risk factors are correlated with certain diseases, but **correlations are not always causations**
- Risk factors can be
  - Aspects of a person's **lifestyle** such as the food they eat or whether or not they drink alcohol
  - **Substances in a person's body or environment** such as air pollution in a crowded city or asbestos in old buildings
  - **Genetic predispositions** to developing certain diseases
  - Other **biological factors** such as age or biological sex
- Many diseases are caused by the **interaction** of a number of factors
  - E.g. the chance of developing CVD is higher in individuals who have a diet high in cholesterol, don't exercise regularly, and smoke; all of these behaviours increase the likelihood of damage occurring to the arteries
- Some factors, such as those related to lifestyle, are to some extent **under the control of the individual**
  - It is usually possible to **make decisions** about diet, smoking, alcohol intake, and exercise levels
  - Note that scientists are becoming increasingly aware that the best choices are easier to make for some than others; unhealthy food choices are often cheaper and easier, and not everyone has time to exercise
- Other factors are **outside of an individual's control**, such as genetics, biological sex, and age

Lifestyle Factors Linked to CVD Table

Lifestyle factor	Associated risk of CVD
Diet	A diet high in saturated fat increases blood cholesterol levels, increasing atheroma formation and therefore thrombosis A diet high in salt increases blood pressure
High blood pressure	Increases risk of damage to artery walls, increasing atheroma formation and therefore thrombosis Note that high blood pressure itself is linked to other lifestyle factors such as stress, alcohol, poor diet, and inactivity
Smoking	Carbon monoxide combines with haemoglobin in red blood cells, reducing its oxygen carrying capacity; this decreases respiration in the cells of the brain and heart which can lead to stroke and heart attack Nicotine causes increased risk of thrombosis by increases the agglutination (stickiness) of platelets Smoking decreases the levels of protective chemicals called antioxidants in the blood; this increases the risk of damage to cells lining the arteries, leading to atheroma formation and therefore thrombosis

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Other Factors Linked to CVD Table

Factor	Associated risk of CVD
Genetics	Individuals can inherit alleles making them more prone to high blood pressure or high blood cholesterol, therefore more likely to develop CVD
Age	The risk of developing CVD increases with age due to blood vessels becoming more fragile and plaque building up over time
Biological sex	Men are three times more likely to suffer with CVD than premenopausal women, most likely due to lower levels of hormones such as oestrogen, which increases levels of good cholesterol in the blood

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Dietary Antioxidants & CVD

- We know that eating fruits and vegetables is good for us; one reason that has been proposed to explain this is that these foods are high in chemicals called **antioxidants**
  - Antioxidants include vitamins such as
    - Vitamin A; found in orange vegetables such as carrots and sweet potato
    - Vitamin C; found in citrus fruits
    - Vitamin E; found in leafy vegetables, some nuts, and some oils
- Some research into antioxidants has been held up in support of the theory that **antioxidants in the diet reduce the risk of heart disease**, but more recent data analysis has suggested that **there is not enough evidence** to conclude this
  - Some recent research even suggests that **antioxidants could increase the risk** of heart disease

The evidence for antioxidants

- We know that vitamin C is important for the **formation of connective tissues** in the body, so it is logical to think that an increase in dietary vitamin C could help to **reduce the damage to the artery endothelial layer** that leads to **atherosclerosis**
  - Atherosclerosis is the process by which fatty plaques called atheromas develop inside a damaged arterial lining
- In a study involving 1 605 men in Finland, 70 men had a heart attack between 1984 and 1992
  - 13.2 % of the men with **low vitamin C** levels had a heart attack
  - 3.8 % of the men with **normal vitamin C** levels had a heart attack
- Many concluded from this study that **increasing vitamin C intake would reduce the risk of heart disease**

Inconclusive evidence

- A **large analysis** of many studies on vitamin C and heart disease was carried out in 2016
  - A study that analyses the results of many existing studies is known as a **meta-analysis**
- The 2016 study showed that there was **no clear relationship** between increased vitamin C intake and a reduced risk of heart disease
- The study also suggested that taking antioxidant supplements **could be harmful to circulatory system health**

- This is an example of an area of study with **conflicting evidence**; it is essential that **all evidence is taken into account** when drawing conclusions or deciding that evidence is still inconclusive

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Investigating the Vitamin C Content of Food & Drink

- Vitamin C is found in green vegetables, fruits, and potatoes
- It is essential for a healthy diet
- The chemical name for vitamin C is **ascorbic acid**
  - Ascorbic acid is a good reducing **agent** and therefore it is easily oxidised
- Methods for the detection of vitamin C involve **titrating** it against a solution of an oxidising agent called DCPIP
  - DCPIP is a blue dye that **turns colourless** in the presence of vitamin C
  - Titration is a **method of chemical analysis** that involves determining the quantity of a substance present by gradually adding another substance; in this case the concentration of vitamin C is determined by gradual addition of a vitamin C solution to DCPIP

Apparatus

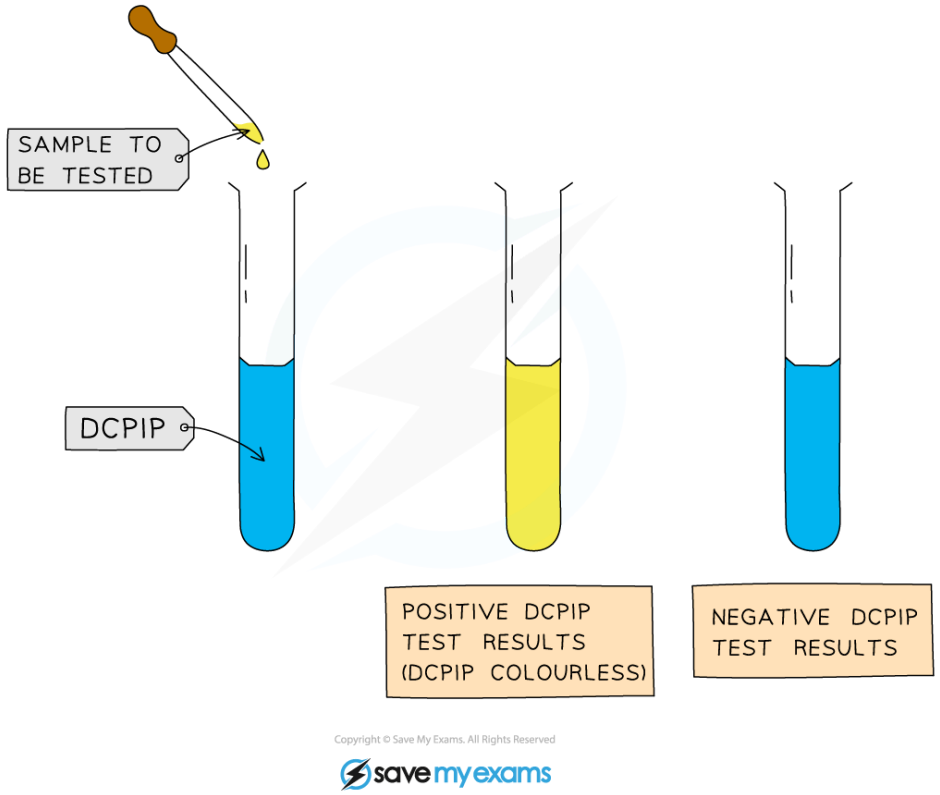
- Vitamin C solutions
- 1% DCPIP solution
- Distilled water
- Range of fruit juices
- Measuring cylinder
- Pipette
- Stop watch
- Test tubes

Method

1. Make up a series. e.g. six, of known vitamin C concentrations
   - This can be done by serial dilution
2. Use a measuring cylinder to measure out 1 cm^3 of DCPIP solution into a test tube
3. Add one of the vitamin C solutions, drop by drop, to the DCPIP solution using a graduated pipette or burette
4. Shake the tube for a set period of time using a stop watch

- It is important to keep the shaking time the same for each concentration; this is a **control variable**

5. When the solution turns colourless record the volume, in number of drops, of vitamin C solution added
6. Repeat steps 2–5 for the same concentration twice more and calculate an average
7. Repeat steps 2–6 for each of the known concentrations
8. Results can be plotted as a line of best fit showing the average volume of vitamin C needed to decolourise DCPIP against the concentration of vitamin C
    - This is a **calibration curve** and can be used to find the concentration of vitamin C in unknown samples such as fruit juices



Drops of vitamin C solution of known concentration can be added to DCPIP to determine the volume required for the DCPIP to be decolourised

Risk assessment

- DCPIP is an irritant
    - Avoid contact with the skin
    - Wear eye protection

Results

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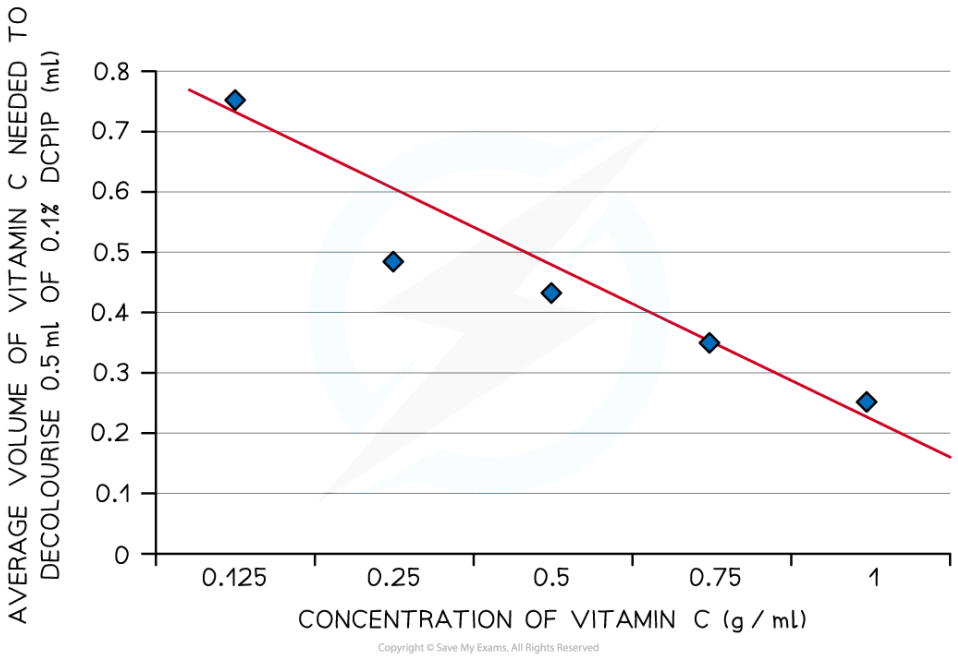
- The volume of vitamin C solution required to decolourise DCPIP should **decrease** as the concentration of the vitamin C solution **increases**
- The results of the experiment can be plotted on a graph of **volume of vitamin C needed to decolourise DCPIP** against the **concentration of vitamin C**
  - The line of best fit for such a graph is known as a **calibration curve**; unknown substances can be compared to it to gain an **estimate** of their vitamin C concentration
- The calibration curve produced from this experiment can be used to **estimate the concentration of vitamin C** in fruit juices



A graph of volume of vitamin C needed to decolourise DCPIP against vitamin C concentration can be used as a calibration curve to estimate the vitamin C concentration of unknown substances

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Quantitative Data on Illness

Analysing data on illness and mortality

- Analysing data on illness and mortality is an essential part of the **study of risk factors**
- It is important to remember that correlation **between a risk factor and a diseases does not always mean that a causal relationship exists**
  - Scientists cannot assume that because there is correlation between variables that one has **caused** the other
  - Many other factors will influence the prevalence and likelihood of disease and these factors need to be taken into account when analysing and interpreting data

Describing data

- This means **identifying trends** and **stating** what the results show e.g. the data show that the oldest age group has the highest relative risk of heart disease
  - When describing data, it is always good to **use numbers** from the data to back up your descriptions, e.g. the data show that the oldest age group of 80+ has the highest relative risk of heart disease of 2.4

Drawing conclusions from data

- This means working out what the data show about the **relationships between variables,** e.g. the data show that there is an **association**, or **correlation**, between age and the relative risk of heart disease
  - Conclusions should always be **limited to what the data show**
    - **Causal relationships** cannot be concluded from **one data set**, e.g. it cannot be concluded from one study that older age **causes** an increase in the relative risk of heart disease
    - Conclusions cannot be **extrapolated beyond the setting of a study** e.g. a study carried out in 40–50 year old adults cannot be applied to people over 70, and a study carried out in mice cannot be directly applied to humans

Evaluating the validity of data

- **Larger sample sizes** are more likely to give valid results as the sample is **more likely to be representative** of the population in question
  - Results are considered to be valid if they measure what they set out to measure, i.e. they are not influenced by external variables or poor experimental design, and have been analysed correctly
- Statistical analysis should be used to check that any **differences between results are statistically significant**

- Some studies need to have a **control** with which to compare the results
  - E.g. when testing a drug to treat heart disease, a control group that is not given the drug should be included in the study to ensure that any effect shown is due to the drug and not any other factor
- Studies should be **repeated**, or there should be **many studies that show the same result**, before conclusions can be drawn
- The study should be designed to **control any variable that is not being tested**
- Researchers should **not be biased**, i.e. looking for a particular outcome
  - This could be a problem if someone is being paid to come up with a particular result

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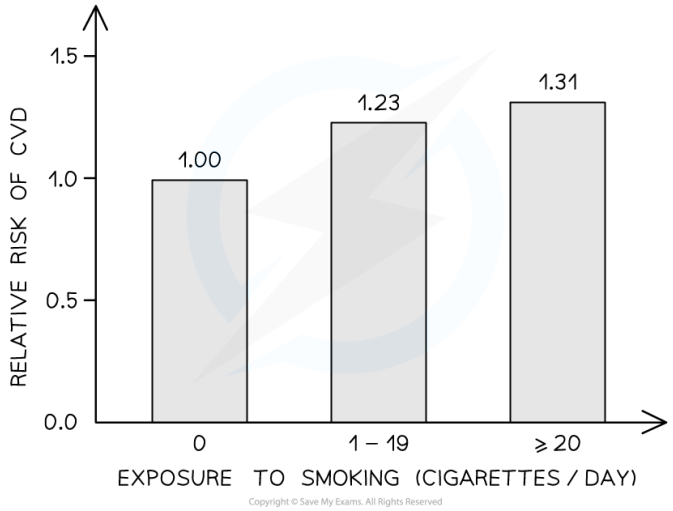
Worked Example

A study was carried out into the relative risk of CVD in non-smoking adults exposed to a range of levels of cigarette smoke from a smoking partner. The study looked at 523 non-smoking partners of smokers.

1. Describe the data
2. Draw a conclusion from the data
3. Comment on the validity of the data



1. A **description** for this data could include the following
   - Non-smokers exposed to 0 cigarettes per day have the **lowest** relative risk of CVD, with a relative risk of 1.00
   - Non-smokers exposed to 20 or more cigarettes per day have the **highest** risk of CVD, with a relative risk of 1.31
   - As the **number of cigarettes smoked per day increases**, the **relative risk of CVD increases** from 1.00 at 0 cigarettes per day, to 1.23 at 1–19 cigarettes per day, and then to 1.31 at 20 or more cigarettes per day

2. A **conclusion** for the data could be
    - There is a **correlation**, or an **association,** between increased exposure to cigarette smoke and an increased risk of CVD
    - Note that while it could be concluded here that increased exposure to smoking **causes** an increase in the relative risk of CVD, it is best not to draw causal connections without more evidence
        - This is only a single study; there may be concerns over its validity, and other studies could show conflicting evidence
3. A commentary on the **validity** of the data could include
    - The study included 523 people; this is a fairly **small sample size** and may not represent an entire population
    - This is only one study; **more studies would need to be carried out** to back up these results
        - Being able to replicate, or repeat, the results of a study shows that the results are reliable
    - There is no information on **how other risk factors might be interacting with smoking** to influence the risk of CVD
        - Risk factors such as age, diet, biological sex, or exercise levels may be playing a role, as these factors may be interacting with the smoking variable e.g.
            - Smokers are often older
            - More men may smoke than women
            - Smokers may be less likely to exercise
    - The data doesn't comment on the **use of any statistical tests** so we cannot state the significance of the differences between the different levels of smoke exposure

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Recognising conflicting evidence

- **Evidence from one study is not enough** to conclude that a risk factor is a risk to health or associated with a particular disease
- **Studies similar in design** would need to be **analysed together** to make links
    - Such an analysis is referred to as a meta-analysis
- **Similar conclusions** would need to be drawn from all studies in order to accept the findings
- **Conflicting evidence** may be found that leads to a different conclusion
    - Conflicting evidence is that which shows a **different pattern** to the evidence gained elsewhere
    - When conflicting evidence arises, **more research** is needed to show which pattern is correct

- Conflicting evidence is often a sign that **other variables** are involved

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Examiner Tips and Tricks

Beware of mixing up correlation and causation.

- **Correlation** is where a change in one variable **occurs at the same time** as a change in another variable.
- **Causation** is where the change in one variable **causes** the change in another variable.

Just because two factors correlate does not mean one causes the other. Be mindful with the words you use when answering questions on data.

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Features of a Good Study on Illness

- There are a number of factors to consider when evaluating the design of a study
  - The **sample** of people included in the study
    - Sample **size** should be **representative** of the population involved; **larger samples** are more likely to be representative
    - **Randomly** selecting participants removes **bias** and increases the likelihood of a representative sample
      - Selecting people from among friends or from among people at a gym, for example, is likely to select people who have similar lifestyles; this would be a biased sample
  - **Control variables;** the more variables that have been **controlled,** the more **reliable** and **valid** the data
    - Reliable data can be reproduced by repeating an experiment
    - Valid data has only tested one independent variable whilst all other variables are controlled
  - **Avoiding bias;** there should be no **bias** involved in the collection or analysis of data
    - Bias in data can come from **human sources,** e.g. by selecting a non-random sample or manipulating data to emphasise a certain outcome
    - Bias can be a problem when, e.g. scientists are employed by a company that desires a particular result, or when scientific funding is dependent on specific outcomes
  - **Controls;** the use of an **experimental control** provides a point of comparison and ensures that the results are due to the variable of interest
    - An experimental control condition in a study should be the same as every other condition except that the independent variable should be absent, e.g. in a drug trial the **control group** would be identical to the group receiving the trial drug, except that they would be given a sugar pill instead of the drug; this is known as a placebo
  - **Repetition;** repeats of the data need to be taken within a study, and similar results should be collected
    - Similar results are **reliable**
  - **Reproducible**; it should be possible to reproduce a set of findings by **repeating an entire investigation**
    - This is why scientists always write up the method used in a study

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Perceived vs Actual Risk

- Risk is defined as the **chance** or **probability** that a harmful event will occur
- The **statistical chance** of a harmful event occurring needs to be supported by **scientific evidence** gained from research
- An individual's **perception** of risk may be different to the actual risk of something occurring
  - Risk can be **overestimated** because of factors such as
    - Misleading information in the media
    - Overexposure to information
    - Personal experience of the associated risk
    - Unfamiliarity with the event
    - The event causing severe harm
    - Lack of enjoyment of an activity
  - Risk can be **underestimated** because of factors such as
    - Lack of information
    - Misunderstanding of factors that increase the risk
    - A lack of personal experience of the associated risk
    - Unfamiliarity with the event
    - The harm being non-immediate
    - Enjoyment of an activity
- The **statistical chance** of an event occurring often bears little resemblance to someone's **perception of the risk**
  - E.g. the global annual risk of being killed in a road accident is **1 in 1 547**, and the global annual risk of death due to crashing during a flight is **1 in 4.5–5.5 million**; despite this people are **far more likely to have a fear of flying than a fear of driving**

Your notes

Data Analysis for Diet & Health

- A **risk factor** is any factor that **increases the chance** of developing a particular condition or disease
  - An increase in a risk factor does not guarantee the development of disease, but increases the risk
  - An example of a risk factor for the incidence of CVD is increased blood cholesterol
- An increase in the presence of a risk factor would be expected to lead to increased **incidence** of disease
  - The incidence of disease describes the **number of cases** of a disease that occur **within a particular group of people within a given time**

Cholesterol

- Cholesterol is a type of **lipid** produced in the body
- Cells require a source of cholesterol for cell membrane functioning, sex hormone structure, and the synthesis of bile
- Cholesterol is transported around the body as **lipoproteins**
  - Lipoproteins are molecules composed of **lipid** and **protein**
  - There are two types of lipoproteins; **high density lipoproteins** (**HDLs**) and **low density lipoproteins** (**LDLs**)
- The **balance of HDLs and LDLs** in the blood is thought to be an important factor in the risk of developing heart disease

High density lipoproteins

- HDLs contain **unsaturated fat**, cholesterol, and protein
- These molecules transport cholesterol **from body tissues to the liver to be recycled or excreted;** they are responsible for **reducing blood cholesterol levels** when it is too high
- HDLs are also thought to contribute to the **removal of cholesterol from the fatty plaques** that form during atherosclerosis

Low density lipoproteins

- LDLs contain **saturated fat**, cholesterol, and protein
- The role of LDL is to move cholesterol from the liver into the bloodstream where it remains until it is required by the cells; they **increase blood cholesterol levels** when it is too low
  - LDLs **bind to receptors** on cell surface membranes, enabling them to be **taken up by the cells** that need them and removing cholesterol from the blood

- High levels of LDLs can lead to blockage of these membrane receptors, **causing blood cholesterol to rise**

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Lipoproteins and heart disease

- **LDLs** are often thought of as 'bad cholesterol'
  - When your body has too much LDL cholesterol the membrane receptors on the surface of cells are blocked, leading to an overall rise in blood cholesterol
  - Cholesterol contributes to the formation of plaques in the arteries
- **High density lipoproteins** are often thought of as 'good cholesterol'
  - This is because HDLs carry cholesterol to the liver where it is broken down and excreted, therefore lowering overall blood cholesterol levels
- Rather than one being bad and the other good, in reality it is the **ratio of LDLs to HDLs** that is important; the healthy ratio is thought to be roughly 3:1 of LDL:HDL
  - It is thought that an LDL:HDL ratio larger than 5:1 increases the risk of heart disease
- While diet is a factor in determining the production of LDLs and HDLs in the body, the way in which the cells process lipids is also thought to be important
- It is important to be able to **analyse data on the link between lipoproteins and CVD**

Evaluating data linked to risk factors

- There are several things that should be taken into consideration when analysing data from studies on health risk factors; if, for example, a study is conducted on the effects of smoking on lung health, then the following should be kept in mind
  - **Sample size;** a study with a large sample size will give results that are more likely to be representative of the target population
  - **Individuals in the sample;** the results of a study can only be applied to parts of the population represented in the sample, e.g.
    - If the sample only contains women aged 20–40 then the results cannot be used to draw conclusions about the effect of smoking on males or older women
  - **Control group;** a study of this nature needs to contain a control group so that the **effects of the variable of interest can be isolated** from the effects of other factors
    - In this example the control group would contain **individuals who do not smoke**; this gives a base line against which the results from the smoker group can be compared
    - All factors other than the variable of interest should be controlled between the control group and the test group, e.g. age, diet, activity levels
  - **Statistical significance;** the differences between groups need to be sufficiently large to be sure that they are not just the result of **random chance**; this is known as being statistically significant

- To determine whether a difference between results is significantly different, **statistical analysis** needs to be carried out
- Statistical significance can often be determined by comparing standard deviations of two data sets
  - If standard deviations overlap then the difference between data sets is not statistically significant
  - If the standard deviations do not overlap then the difference is statistically significant

- **The influence of other variables;** variables other than the variable of interest need to be controlled so that they do not impact the results; in this study such control variables might include
  - Genetics
  - Secondary exposure to smoking
  - Exercise levels
  - Diet

Worked Example

The graph below shows different lipoproteins with their associated cardiovascular disease rate. Note that the bars represent the standard deviations of the data sets.

The study involved 300 men aged between 40 and 80. Their LDL and HDL levels were measured over a period of 30 weeks and mapped against developing CVD events such as atheromas and thrombosis

1. Describe the data
2. Draw a conclusion
3. Comment on the validity of the data. Note that validity refers to a study that successfully measures the variable that it sets out to measure, without influence from any other factors.

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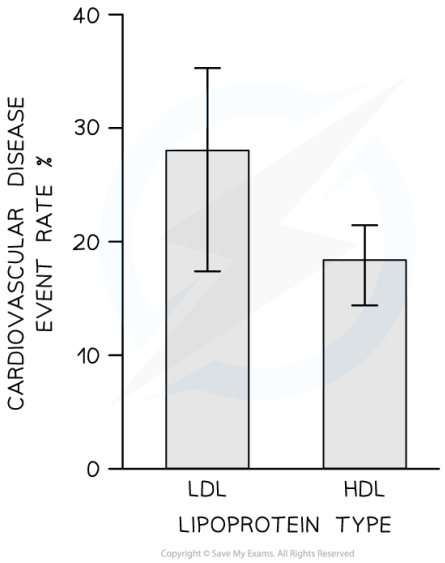

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1. Describe the data

The graph shows that the cardiovascular event rate percentage is higher with LDLs compared to HDLs

The cardiovascular event rate with LDLs is around 28 % while the event rate percentage for HDLs is around 18 %

2. Draw a conclusion

There is no significant difference in percentage of CVD events with LDL and HDL as there is an overlap of the standard deviation bars

3. Comment on the validity of the data

A sample of 300 men is very small in relation to an entire population, so needs to be larger in order to be representative

Only men between 40 and 80 were sampled, so the data is not representative of the entire population

Other factors relating to CVD are not measured or commented on, e.g. smoking, diet, exercise; such factors would need to be controlled between the two groups or measured so that their effect can be eliminated from the data

Examiner Tips and Tricks

When dealing with data there are a few important things to remember

- It is always a good idea to **include numbers** when you are describing a data set
- **Correlation is not causation**; when drawing conclusions it is always best to say 'there is a correlation' or 'there is an association' between two variables rather than stating that one has caused the other

- Look for clues about the **validity of the experiment.** Is the sample representative? Have other variables been controlled? Has statistical analysis been carried out?

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Correlation vs Causation

Evidence linking blood cholesterol to CVD

- High cholesterol is listed as one of the five main risk factors for heart disease by many **research studies** and organisations such as the British Heart Foundation and the NHS
- There is evidence of a correlation between high blood cholesterol levels and an increased risk of CVD
  - Medical treatments such as statins, which reduce blood cholesterol levels also reduce risk of heart disease
  - Diets high in **saturated fats**, which tends to raise LDL cholesterol levels in the blood, have been linked to increased CVD events
  - A significant reduction in total blood cholesterol levels is linked to a decrease in major coronary events
  - Arterial plaque regression has been observed alongside blood lipid-lowering therapy, which has led to a reduction in major cardiovascular events
- Note that when considering scientific evidence it is essential to remember that **correlation is not the same as causation**; a connection between two events, e.g. a diet high in saturated fat and raised LDL cholesterol, may not mean that one has caused the other
  - It may be that there is a **third variable** that has not been measured that is influencing levels of LDL cholesterol, e.g. the presence of alleles that influence the way in which cells metabolise dietary fats

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Measurements to Reduce CVD Risk

Diet

- Some scientific studies have linked a **diet high in saturated fats** to an increased risk of CVD
  - It is worth noting that there are other studies that are **inconclusive** on the link between dietary saturated fat and CVD risk
- Studies that investigate the connection between diet and CVD can be used to **educate members of the public** on their consumption of certain foods
  - **Food labels** now exist on most food packaging making consumers aware of what they are eating
  - Traffic light warning labels (Red = high, Orange = medium, Green = low) also exist on many food labels to warn consumers of high levels of sugar, saturated fat, and salt
  - People are able to **make informed choices** about their diets
- **Obesity** has been linked to an increase in CVD events
- Healthcare professionals can use a number of measures to identify obesity in patients
  - **Waste-to-hip ratio** is the circumference of the waist in cm divided by the circumference of the hips in cm
    - For women the ratio should be less than 0.86
    - For men the ratio should be less than 1.0
  - **BMI** is a value derived from dividing an individual's mass in kg by the square of their height (m^2)
    - A BMI of less than 18.5 indicates that the person is underweight
    - 18.5 - 24.9 is considered normal
    - 25 - 29.9 is considered overweight
    - A person with a BMI of 30 or higher is considered obese
- Obese individuals can make lifestyle choices to reduce their weight to a healthy range

Smoking

- **Smoking has been linked to CVD** by many research studies
- The research has led to changes in the way cigarettes are advertised
  - **Health warnings** now exist on all packets
  - TV and media portray smoking as an **unhealthy lifestyle choice**

- Free materials, including prescriptions, are available to **support individuals to stop smoking**

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Exercise

- **Inactivity** has been linked to increased risk of CVD
- There are many campaigns and initiatives to encourage all people to **partake in more exercise**
  - Increased hours of physical education in schools
  - Targeted encouragement at different groups of people, such as teenagers

Your notes

Treatments for CVD: Benefits & Risks

- While reducing the risk factors and lowering the risk of developing cardiovascular disease (CVD) is the best option, CVD is still very common and treatment options are needed
- There are a number of different **treatment options** for cardiovascular disease, many of which involve taking **medication**
- Types of medication for the treatment of CVD include
  - Antihypertensives
  - Statins
  - Anticoagulants
  - Platelet inhibitors

Antihypertensives

- These drugs work by **lowering blood pressure**
  - High blood pressure is also known as **hypertension**
- Lowering blood pressure **reduces the risk of arterial endothelial damage** and therefore reduces the risk of atheromas and thrombosis
- **Beta blockers, vasodilators** and **diuretics** act as antihypertensives
  - Beta blockers prevent increases in heart rate
  - Vasodilators increase the diameter of the blood vessels
    - ACE inhibitors are a type of drug that block the production of angiotensin, a hormone that causes constriction of the blood vessels
    - This keeps the arteries dilated, which lowers the blood pressure
  - Diuretics reduce blood volume by decreasing the amount of sodium reabsorbed into the blood by the kidneys, therefore decreasing the volume of water reabsorbed into the blood

Statins

- These drugs work by **lowering blood cholesterol**
  - They block an enzyme in the liver which is needed to make cholesterol
- This **lowers the LDL concentration** in the blood therefore reducing the risk of atheroma formation
  - LDLs are sometimes known as 'bad' cholesterol; at high levels they increase the risk of atheromas forming

- Statins also **reduce inflammation** in the arterial lining, which lowers the risk of atherosclerosis

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Anticoagulants

- These drugs **reduce blood clotting**
  - Blood clotting can be referred to as blood coagulation
  - Warfarin is an anticoagulant that decreases the level of prothrombin in the bloodstream
- Reduced formation of blood clots **decreases the likelihood of thrombosis** and therefore reduces the risk of blood vessels being blocked by blood clots

Platelet inhibitors

- These are also substances which **reduce blood clotting**
  - Platelet inhibitors are a type of anticoagulant
  - **Aspirin** and clopidogrel are the most commonly used examples of these drugs
- They prevent the clumping together of **platelets,** so preventing the formation of blood clots

Benefits and Risks of Cardiovascular Disease Drugs Table

Type of drug	Benefits	Risks
Antihypertensives	Reduce blood pressure Blood pressure can be monitored at home to check that drugs are working Drugs work in different ways so they can be combined to maximise effectiveness	Side effects include headaches, drowsiness, heart palpitations, swelling of the feet and ankles, and persistent cough Patients may stop taking medication due to side effects
Statins	Reduce the levels of 'bad' LDL cholesterol in the blood, so reducing the risk of atheroma development Increase the levels of 'good' HDL cholesterol in the blood, which aids with further removal of LDL cholesterol	Can take a while to become effective Need to be taken long-term to remain effective Side effects include muscle and joint pain, liver damage, and neurological issues Taking statins may give patients a false sense of security, leading to a return to an unhealthy lifestyle
Anticoagulants	Reduce the formation of new blood clots Can reduce the size and growth of existing blood clots	Can cause excessive bleeding if injury occurs, including internal injury Side effects include fainting, osteoporosis, and swelling of tissues Can damage the foetus if taken
Platelet Inhibitors	Reduce the formation of new blood clots, and so the risk of blood vessel blockage	Can cause excessive bleeding if injury occurs Can cause side effects such as rashes, liver dysfunction, and stomach lining damage Combining more than one type of platelet inhibitor can increase the risk of harmful side effects

Your notes