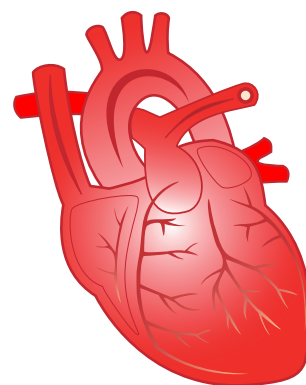


HEALTHY HEARTS: TEACHER'S NOTES



Acknowledgements

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Overview

This task challenges pupils' ability to use mathematical techniques (scatter diagrams) to present and interpret relationships between sets of data.

The theme is investigating potential dangers associated with cholesterol and fats.

Prior Learning

To complete the task successfully, pupils will need to have the knowledge, understanding and skills listed below.

In Mathematics:

- Understanding how to read and present limits as class intervals
- Choosing and investigating a hypothesis
- Drawing scatter diagrams and using lines of best fit
- Identifying the relationship between two data sets by interpreting correlation
- Understanding and recognising outliers
- Evaluating outcomes and making conclusions.

In Biology:

- Knowledge and understanding about healthy lifestyle choices and diet
- Understanding of health risks and the effect of cholesterol on increasing risk of heart disease

- Knowledge and understanding of the term Body Mass Index (BMI)
- Knowledge and understanding of the units used to measure BMI, saturated and unsaturated fats, and cholesterol.

General

The 'About Your Research Area' section introduces pupils to the two types of cholesterol and two types of fats featured in the task.

Through class discussion, pupils should be able to talk about what are deemed 'good' and 'bad' cholesterol, as well as 'good' and 'bad' fats.

The next section, 'About Your Task', introduces body mass index (BMI). Although the text gives enough detail to enable the pupils to complete the task, it does not explain how to calculate BMI. You may choose to cover this with your pupils in more detail.

Throughout the activity, pupils need to use the data provided to decide if there is any relationship between sets of two variables that may be associated with heart disease. They draw scatter diagrams to show correlation. They use this correlation to determine what relationship the variables have with each other, if any.

ACTIVITY

For questions 1 to 4, pupils should present their findings in the following format:

- a hypothesis stating what they expect the relationship between the two variables may be;
- an explanation of how they will test their hypothesis;
- a scatter diagram showing the relationship (if any);
- an explanation of what the scatter diagram shows, referring to the strength of the correlation and any apparent outliers; and
- a statement of whether or not their test has shown if their hypothesis was correct.

The purpose of investigating whether there is a relationship between BMI and cholesterol is to help pupils recognise that even people who are not deemed to be overweight can have high cholesterol.

In question 6, pupils should write an explanation that refers to:

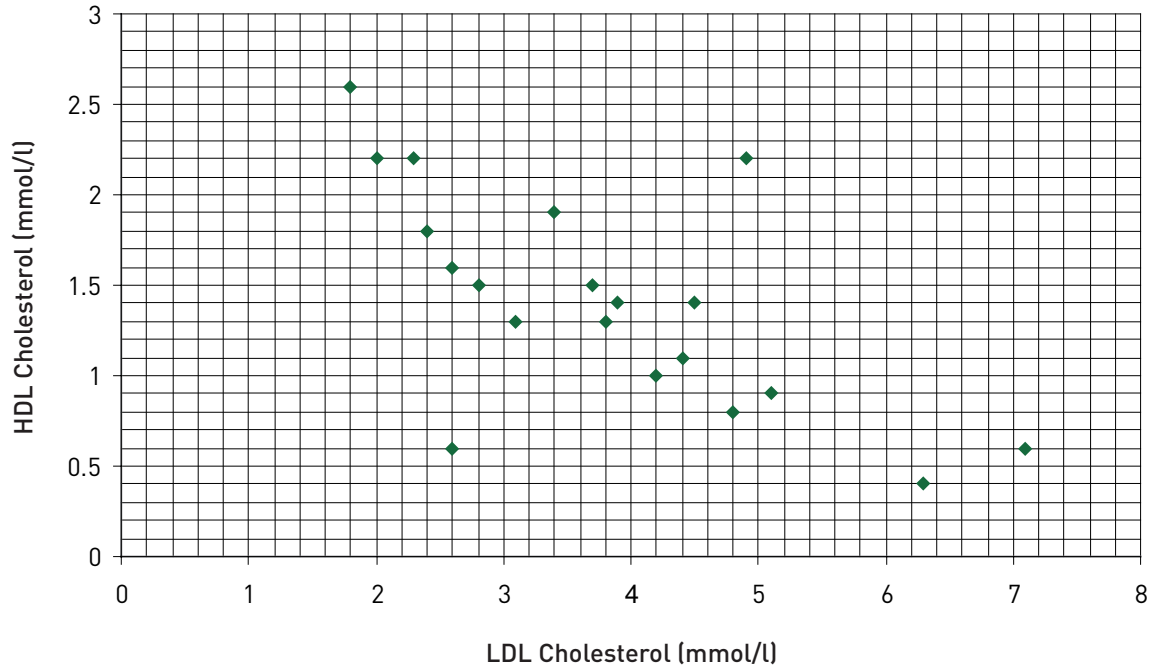
- the outcomes of their tests; and
- the information in Tables 1 and 2.

Scatter Diagrams and Examples

Using the data provided in Table 2, pupils should produce scatter diagrams similar to those shown. We have not included lines of best fit, but pupils should draw their own, where possible.

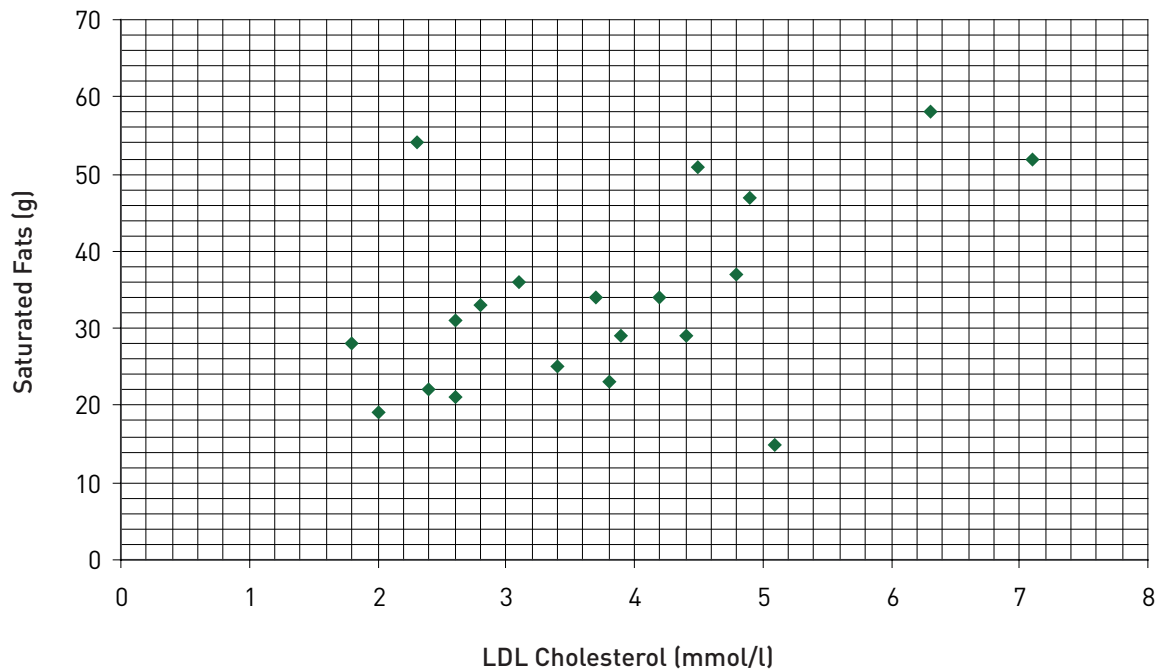
1

LDL and HDL



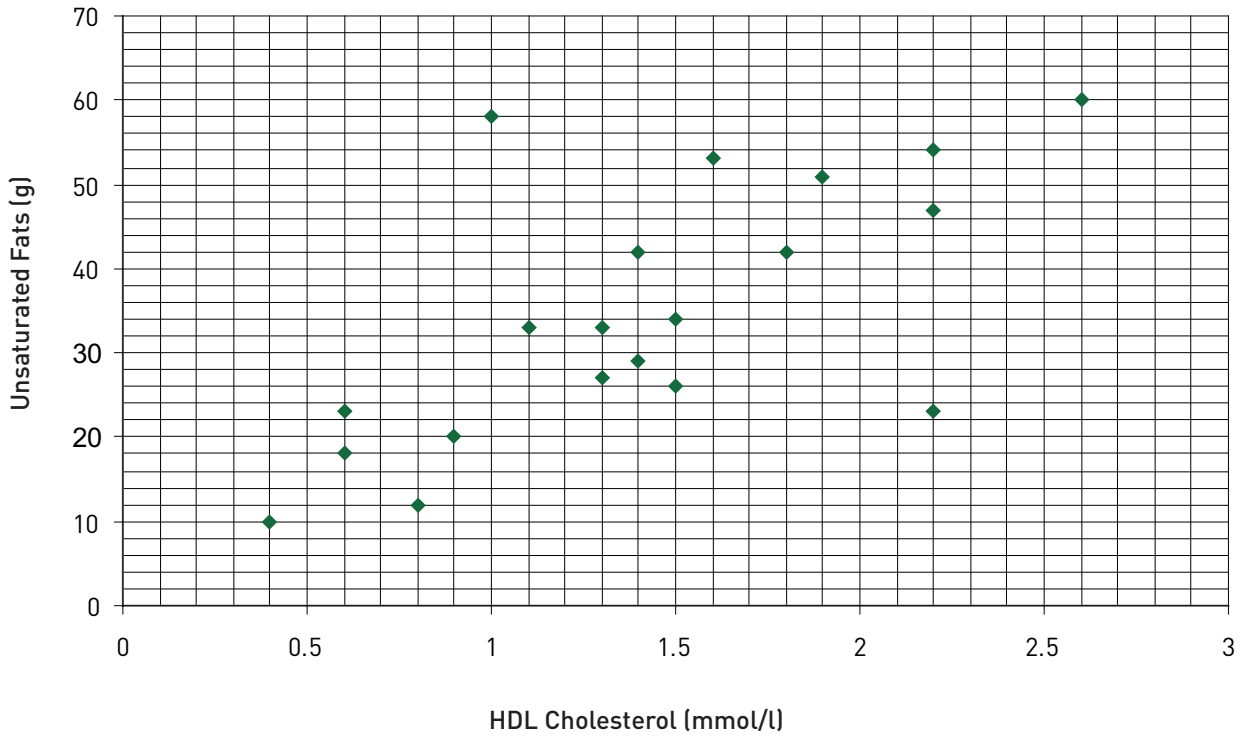
2

LDL and Saturated Fats



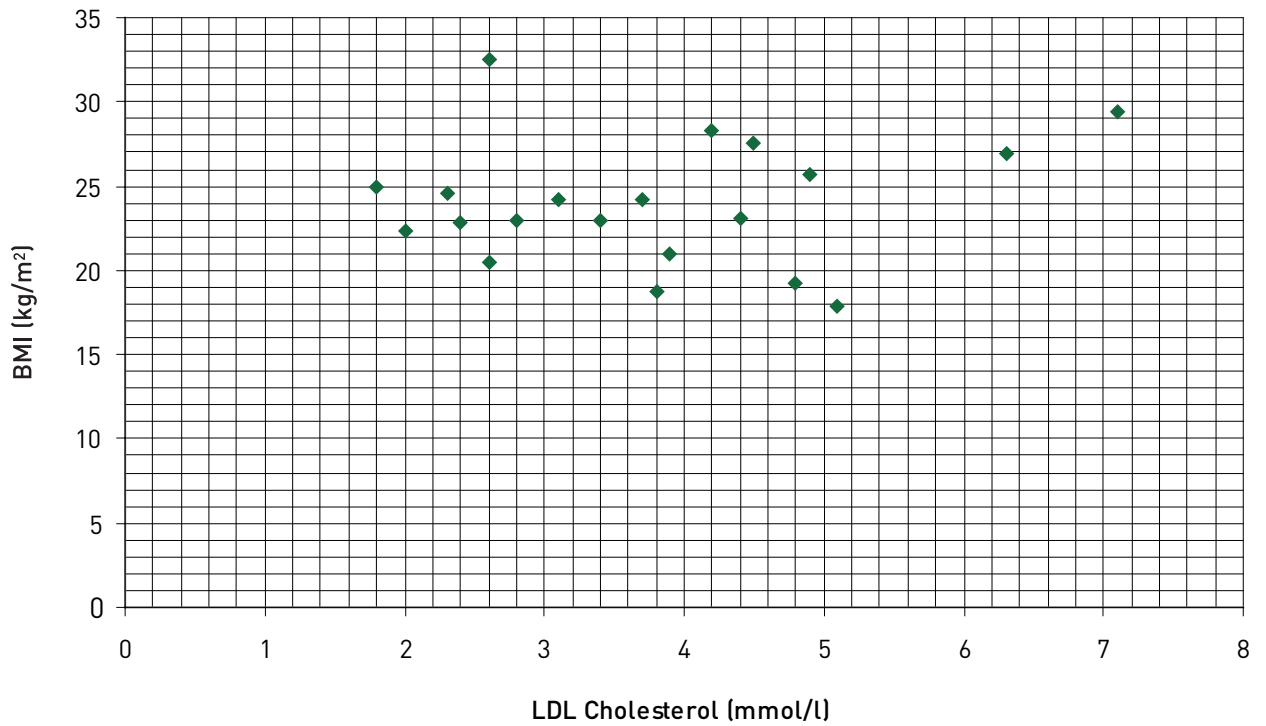
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HDL and Unsaturated Fats



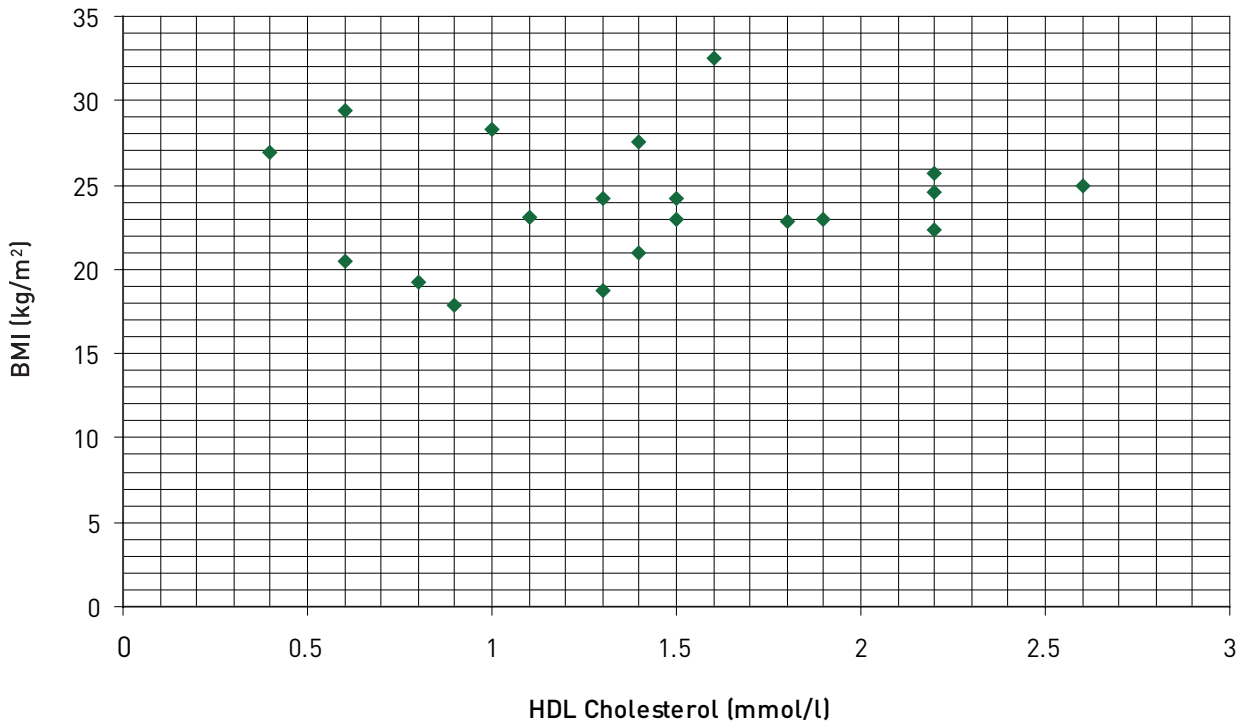
4

LDL and BMI



5

HDL and BMI



- 5 In question 5, pupils need to show an example of a hypothetical patient with suitable LDL cholesterol and HDL cholesterol values. Using these values and their lines of best fit, the pupils could predict the saturated and unsaturated fat intake for the patient.
- 6 (Example) Patients 1, 12 and 14 all seem to have very high levels of bad cholesterol (LDL) and low levels of good cholesterol (HDL). They also eat higher than average levels of saturated fats (the mean average for the 20 patients is 33.8g) and lower than average levels of unsaturated fats (the mean average for the 20 patients is 33.25g).

Taking the background information and answers to questions 1 to 4 into account, this would suggest that they could be at risk of heart disease.

Healthy Hearts Assessment Grid

If you use Healthy Hearts to assess the Cross-Curricular Skill of Using Mathematics, the following assessment grid highlights the Requirements and the Knowledge and Understanding that your pupils will cover in the task. It gives examples of how pupils might demonstrate these at Levels 6 and 7.

Pupils should be enabled to:	Level 6	Level 7
Context	Through discussion, solving routine and non-routine problems with increasing independence in a wide range of familiar and unfamiliar contexts and situations, pupils can:	Through discussion, solving routine and non-routine problems with increasing independence in a wide range of familiar and unfamiliar contexts and situations, pupils can:
<ul style="list-style-type: none"> • use mathematical knowledge and concepts accurately; • work systematically and check their work; 	<ul style="list-style-type: none"> • use a range of appropriate mathematical techniques and notation; Pupils use scatter diagrams to test the relationships between the different sets of data. They are able to highlight outliers where appropriate. They use correlation to determine the relationship between the variables. • work systematically and efficiently to a given degree of accuracy; Pupils have a clear, step-by-step approach to working through the task. They answer each question in the format shown in the teacher's notes. They also choose suitable scales for the axes in each scatter graph. • review their work, using appropriate checking procedures and evaluating their effectiveness at each stage; Pupils are able to identify and comment on any outliers apparent in their scatter diagrams. They also discuss how the correlations have confirmed their hypotheses (or not). 	<ul style="list-style-type: none"> • use a range of appropriate mathematical techniques and notation; Pupils use a line of best fit to highlight the strength of the correlation shown for two variables. They also use it to identify further values. • critically review to what extent they succeeded in carrying out activities, checking if the level of accuracy and their findings are appropriate and making an assessment of any limitations; Pupils give a clear account of whether they feel they have confirmed their hypotheses or not. They discuss the reliability of using their scatter diagrams to do this. They comment on the strength of the correlation and the effectiveness of using a line of best fit to determine unknown values. They comment on the reliability of their testing using such a small sample (N=20). They give possible reasons why there are outliers, for example incorrectly recorded or calculated data. They can also refer to Tables 1 and 2 when making conclusions and answering question 6.

<ul style="list-style-type: none"> • explore ideas, make and test predictions and think creatively; 	<ul style="list-style-type: none"> • make and test predictions, make general statements and draw conclusions; Pupils state a hypothesis for each relationship they intend to test. They then discuss whether or not they have managed to confirm their prediction. They are able to refer to the strength of the correlation and suggest what impact it has on their evaluation. 	<ul style="list-style-type: none"> • make and test predictions and justify their generalisations; Pupils provide a clear explanation within their overall conclusion for what they believe to be the biggest factor(s) in heart disease, based on the data provided. They use their findings to justify their reasons, taking into account the sample size and how general their conclusion would be. They should refer to particular patients that show any contradictions to their findings.
<ul style="list-style-type: none"> • identify and collect information; • read, interpret, organise and present information in mathematical formats; 	<ul style="list-style-type: none"> • obtain, process and interpret information from a range of sources; Pupils use the data from both tables to interpret what they expect to find and what their hypothesis is. They also use the data along with their findings to arrive at an overall conclusion. • use a range of suitable ways to present findings, following accepted conventions; Pupils use scatter diagrams to present and identify the correlation of the data sets for each question. They are also able to highlight outliers. 	<ul style="list-style-type: none"> • select and use the most appropriate methods to present findings, following accepted conventions; Pupils use a line of best fit to predict further values. The line of best fit, where appropriate, is the most suitable for each scatter diagram, i.e. drawn through the 'mean point', as close to all the points as possible with an equal number of points above and below the line.

Knowledge & Understanding		
Handling Data	<ul style="list-style-type: none"> • construct and interpret a variety of diagrams and graphs for discrete and continuous data. <p>Pupils use scatter diagrams to identify the correlations for each set of data. They can relate these to the relationship that the two variables have with one another.</p>	<ul style="list-style-type: none"> • pursue their own lines of enquiry, using appropriate methods of data collection, and interpret and present their findings. <p>Pupils use the correlation strengths shown in their scatter diagrams to justify their evaluations and conclusions in line with the raw data provided in the two tables.</p>