

What's in your breakfast?

Investigating the nutritional content of breakfast cereals

Teachers' notes

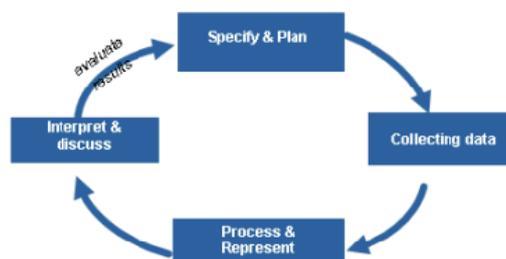
Introduction

This activity makes use of TI-Nspire data-handling facilities to investigate the nutritional contents of breakfast cereals. This activity could provide an introduction to data entry and other features of 'Lists & Spreadsheets' and encourage the use of ICT.

The introduction to the activity using the 'traffic light' food labelling system enables students to meet and work with inequalities in a real context.

The main activity suggests possible lines of enquiry and provides a small database of information on a selection of breakfast cereals in a TI-Nspire file, with a few examples of how such data might be explored and analysed. Ideally students should pose their own questions and select or collect their own data to analyse using the Handling Data cycle. Suggestions for where to obtain further data are given.

The Problem-Solving Approach



Background information

There is a wide range of information on the internet about the nutritional content of foods including on manufacturers and fast food restaurant chain websites. Some examples of these, together with other sources of nutritional information are given later in the activity.

Sources of further ideas:

One school in the QCA 'Engaging mathematics for all learners' project <http://www.qcda.gov.uk/22221.aspx> set their students the task of posing their own questions comparing different types of meals from a well know fast food restaurant chain.

'What's in your bowl?'

The Royal Statistical society in association with QCA have produced and trialled data-handling lesson materials. <http://www.rsscse.org.uk/qca/resources0.htm>

There are eight activities, one of which is 'What's in your bowl'. The activity is aimed at 11-14 year olds. Lesson suggestions, background information, teachers' notes, pupil worksheets and a PowerPoint presentation can be found at <http://www.rsscse.org.uk/qca/resource7.htm>

The emphasis is on pupils suggesting their own questions, planning which data to collect and how to collect it and planning how to organise and analyse the data and communicate their findings.

Using TI-Nspire

The TI-Nspire activity gives students a sample data file and instructions for how to manipulate it. They can then go on to plan their own investigation and collect and analyse their own data. Some sources of internet data are in table or spreadsheet form. These can be copied and pasted into a Lists & Spreadsheet page of TI-Nspire. It may be easier to paste larger data sets into a spreadsheet such as Microsoft Excel first, and then to copy and paste extracts from this into the TI-Nspire. Examples of particular TI-Nspire features that might be useful are also given in the STEM activities introduction booklet.

The Activity

The RSS QCA activity 'What's in your bowl?' has discussion suggestions and lesson ideas and recommends a number of websites for further information. Two possible starting points for discussion are suggested below, the first of which could link into the second.

Recommended Daily Allowances (RDA)

The guideline daily amounts for adults are usually quoted as:

Energy	2000Kcal
Protein	45g
Carbohydrate (of which sugars)	230g (90g)
Fat (of which saturates)	70g (20g)
Fibre	24g
Salt (of which sodium)	6g (2.4g)

Possible Discussion Points:

- What does this mean?
- Which types of food contain carbohydrate, sugar, fat, fibre etc?
- Which of these should you only eat in moderation and the figure shown is the maximum recommendation?
- Which of these are important and you should aim to eat at least as much as the amount shown?
- How well do you think your food intake for an average day compares with this?
- How could you find out?
- How is food labelled to help you find out?

More information on the traffic light system for labelling is given below.

The TI-Nspire file gives information obtained from a number of breakfast cereal packets.

The RSS QCA activity has information from a number of breakfast cereals.

It would also be useful to have some examples of cereal packets for students to view

Some points to note:

- Men, women and children:** The above figures are the most common ones quoted. The figures shown are sometimes given as the figures for women, with those for men being slightly higher and those for children being slightly lower. These figures could be increased for people with a very active lifestyle. A factsheet of food labels is available from <http://www.bda.uk.com/Downloads/foodlabels.pdf>
- Portion size:** The figures used in the TI-Nspire file for Breakfast cereals are for 100 grams of cereal not an average portion with milk. Portion sizes for different cereals vary and the size suggested by the manufacturer is shown in a column on the spreadsheet. However, research has shown that the average portion size actually used tends to be considerably greater than that the manufacturers' suggestions.

- **Salt and sodium:** The TI-Nspire spreadsheet contains the figure for salt. Most packets now have both sodium and salt mentioned, but some manufacturers' website only give the sodium content. The salt content would be 2.5 times the figure given for sodium.
- **Maximum or minimum:** For some of the contents such as salt, sugar and fat the figure is a recommended daily maximum while for others such as fibre and protein it is a minimum. This is an important discussion point.

Traffic light food labelling

To simplify checking the nutritional content of food, the Food Standards Agency has introduced a 'Traffic light' food labelling system on the front of some food packets.

Green means low (good)

Amber means medium (fair)

Red means high (bad)

	Low (Green) Per 100g	Medium (Amber) Per 100g	High (Red) Per 100g	Foods are also labelled as High (red) if one portion contains
Fat	$\leq 3.0g$	$> 3.0g$ $\leq 20.0g$	$> 20.0g$	$> 21.0g$
Saturated fat	$\leq 1.5g$	$> 1.5g$ $\leq 5.0g$	$> 5.0g$	$> 6.0g$
Sugars	$\leq 5.0g$	$> 5.0g$ $\leq 12.5g$	$> 12.5g$	$> 15.0g$
Salt	$\leq 0.30g$	$> 0.30g$ $\leq 1.50g$	$> 1.50g$	$> 2.40g$

Note: Most manufacturers only include the total figure for sugars. Some sugars are naturally occurring (e.g. in fruit added to breakfast cereals) and some sugar may be added in the processing. There are some variations in the traffic light labelling for the two types but this has not been included here.

Initial activity

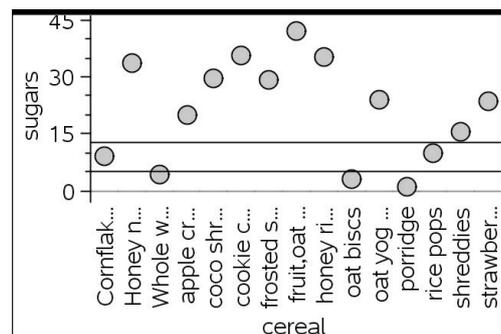
Students look at the contents of the breakfast cereals and try to apply the 'Traffic light' labelling system to the salt, sugar, fat and saturated fat content of them. The RSS QCA activity has a work sheet for this.

How can you quickly identify which cereals are green, amber or red for fat, sugars etc.?

One way to do help with this is to

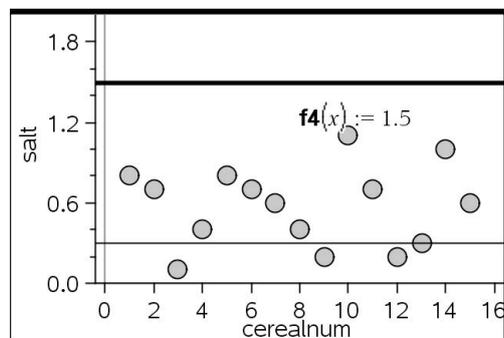
- display the data as a 'dot plot' on a 'Data & Statistics' page and then to
- add two 'movable lines' (menu 4) and to
- grab and drag these lines to the appropriate places getting the figure displayed as close as possible (this could be practice at interpreting inequalities and decimal numbers)
- **line 1:** to the boundary between green and amber (5.0g for sugar, 0.3g for salt)
- **line 2:** between amber and red (12.5g for sugar, 1.5g for salt)

Which cereals would have green, amber, red labels?



This can give a feel for the boundaries and a quick picture of the results but is not very accurate.

- If the cereals were numbered, the data could be displayed as a scatter plot from menu 1 on a 'Data & Statistics' page.
- Boundary lines could be entered as functions using 'Plot function on menu 4. (Note: Y window setting was increased)
- A 'Graphs' page could also be used.



Main Activity: What's in your breakfast?

1. Pose questions

After the initial discussions and activity hopefully students have some ideas of the sort of questions they might consider about the nutritional content of breakfast cereals.

Students may wish to group cereals under certain headings for comparison such as

- ❖ main cereal content – wheat/ oats or wholegrain/ others
- ❖ specific additions – honey ; chocolate ; nuts; fruit

Teachers may wish to guide this discussion if they want to encourage specific statistical concepts and processes such as comparing two distributions or looking for possible correlation. For example:-

- ✚ Do chocolate cereals contain more sugar than honey cereals?
- ✚ Do cereals with more sugar contain less protein?

2. Collect data

Having decided on the question they wish to investigate, students could use the given spreadsheet and make their own additions or set up their own spreadsheet using instructions in the introduction to this booklet. Possible sources of data are:-

- ❖ The spreadsheet in the TI-Nspire file which has a mixture of figures from different sources
- ❖ Information on cereal packets
- ❖ Information on manufacturers' web sites.
- ❖ Data from the RSS QCA activity 'What's in your bowl?'
- ❖ The activity does not need to be comparing breakfast cereals. Fast food restaurants also have comprehensive data on their web sites about the contents of their food.

Breakfast cereals

- <http://www.kelloggs.co.uk/products/>
- <http://caloriecount.about.com/quaker-oats-nutrition-m2>
- <http://www.cerealpartners.co.uk/>
- <http://www.weetabix.co.uk/nutrition/>

Others

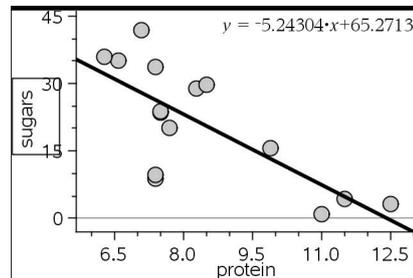
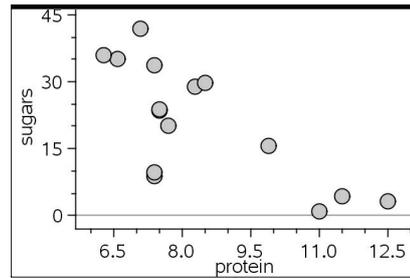
- http://nutrition.mcdonalds.com/nutritionexchange/nutrition_facts.html#download
- <http://www.burgerking.co.uk/nutrition>
- <http://www.wimpy.uk.com/menu-bgr.html>
- <http://www.pizzahut.co.uk/restaurants/menus--deals/dietary-information.aspx>

3. Analyse and present the data & 4. Interpret and Discuss

There are further ideas for doing this in the activity 'Reaction Times' and in the introduction to this booklet. Students should already have collected appropriate data to answer their questions.

Example A: Looking for correlation - Do cereals with more sugar contain less protein?

- Insert a 'Data and Statistics' page
- From menu 2 select 'Add X variable' and select protein (or sugar)
- Then select 'Add Y variable' and choose sugar (or protein)
- What does the diagram show?
- Does it look like there is reasonable correlation between these figures? What type of correlation?
- Would a line of best fit be appropriate?
- What would this show?
- What else could you use? (More advanced students)



Example B Comparing distributions – Do fruit cereals contain more fibre than non- fruit cereals?

Note that the spreadsheet of data in the TI-Nspire sample file contains a mixture of cereals and has not been set up for a specific question such as the one posed here, so this is used as an example of the use of TI-Nspire and not of a good investigation.

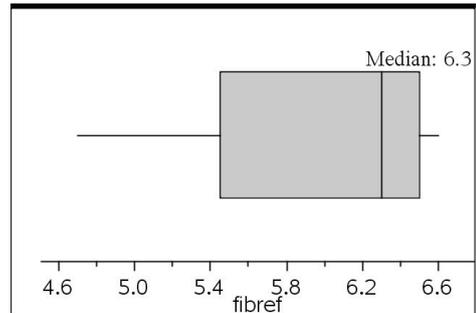
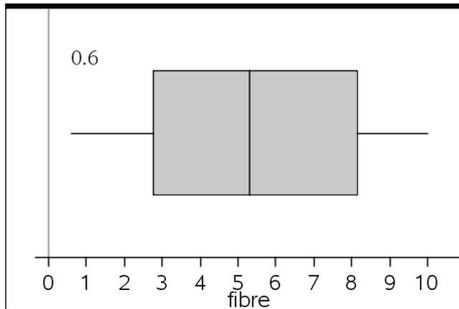
- Open a New Document and Copy and paste the two sets of data for the different types of cereals into separate 'Lists & Spreadsheet' pages in the same document.
- You will need to manually insert the column headings and should ensure that you use different names for the two pages (note that the second page has kcal, proteinf etc)
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cereal	kcal	protein	carbs	sugar	fat	satfat	fibre	salt
Cornflakes	379.	7.4	84.8	8.9	1.2	0.4	3	0.8
Whole wheat biscuits	338	11.5	68.4	4.4	2	0.6	10	0.7
porridge	356	11	60	1.1	8	1.5	9	0.1
oat biscuits	377	12.5	63.7	3.2	8	1.3	7.3	0.4
shreddies	351	9.9	73.7	15.5	1.9	0.4	9.8	0.8
Honey nut cornflakes	397	7.4	81.7	33.6	4.5	0.9	2.5	0.7
frosted shreddies	358	8.3	77.7	29	1.6	0.3	3.7	0.6
honey rings	369	6.6	79.2	35.1	2.8	0.8	5.8	1.1
coco shreddies	358	8.5	76.6	29.6	2.6	0.7	0.6	0.3
cookie crisp	375	6.3	80.4	35.8	3.1	1.2	5.3	1
rice pops	384	7.4	84.8	9.7	1.3	0.6	1.5	0.6

A	fruitcereal	B	kcal	C	protein	D	carbs	E	sugar	F	fat	G	satfat	H	fibref	I	salt	J	K
1	fruit, oat and bran flakes		344		7.1		72.7		42		2.8		0.5		6.6		0.4		
2	strawberry crisp		440		7.5		67.5		23.5		15.6		4.8		6.2		0.2		
3	apple crunch		440		7.7		65.4		20		16.5		8.3		4.7		0.7		
4	oat yog and fruit crunch		424		7.5		65.2		23.9		14.8		7.9		6.4		0.2		
5																			
6																			
A	fruitcereal																		

A Box plot is a quick way to compare and analyse these two sets of data

- First insert a 'Data & Statistics page' and set the caption to the appropriate data set e.g. cereal.
- Then 'Add X variable' (menu 2) or move to the centre of lower edge of the screen and select variable. Choose the variable from the list e.g. fibre for cereal or fibref for fruitcereal.
- This will give you a dot chart. Then from menu 1 select Box plot. Repeat for the second set of data.



- The two diagrams above were produced automatically using the default scale settings. Menu 5 and 'Window settings' could be used to set them to the same window for comparison. They could also be shown side by side by changing the page layout.

✚ What questions would you ask about these two diagrams and what they showed? The mean, median, quartiles and maximum and minimum values can all be found from these box plots or by using the spreadsheet and catalogue features to do the calculations.