

Teacher's Notes: Sugar guzzlers

Spend around 5-10 minutes discussing the context with the students.
You might want the students to work in small groups so they can discuss their work with each other.

The purpose of this activity is to carry out a statistical investigation in the same way a statistician would. This activity focuses on data manipulation and working with averages.

After this lesson students will know:

- how the statistical investigation process works
- that data can be manipulated
- how to find and select an average from a dataset.

You may like to introduce the activity by asking students what their favourite drinks are and to guess how much sugar is in each drink. This information is on the student's worksheets so don't hand them out until after the activity is introduced. You could also relate 6kg of sugar to some thing the students experience like three 2 litre milk bottles full of sugar or a whole desk full of sugar or the weight of both of the students' legs.

The article that claims that the average student drinks 6kg is from the New Zealand Herald. Here is the link:

<http://www.nzherald.co.nz/index.cfm?ObjectID=10127574>

Resources
checklist

For each group:

- Graph paper or access to computer or calculator

Problem



Is the amount of sugar drank in a year by an average student in your class or CensusAtSchool likely to be 6kg?

Formulating and defining a statistical question is important as it tells students what to investigate. For example: How will you identify the average student? What is a drink? Is soup a drink?

There are several ways of investigating this problem. The questions in this activity have been written to encourage students to either work out the total amount of sugar the class drinks in a year and then divide that by the number of students in the class to identify the average (mean or median) student in terms of the amount of sugar they drink in a day and then multiply that by the number of days in a year.

Plan



1. How would you answer the question now, before you gather the data? YES / NO. If you answered NO, what do you predict the amount of sugar drunk in a year by an average student to be? _____Kg.

Students learn more effectively if they are encouraged to make predictions and then to test them and reflect on the difference between their prediction and the result.

2. Can you remember all the drinks you have had in the last year? YES / NO no one can remember every drink they have had in the past year. This introduces the concept of an 'average or typical day'

Assume that yesterday was an average day. What did you drink? Fill in the table below.

Students enjoy statistical investigations if they are included in the data.

3. Why do you think it is important to know how much sugar each drink contains? It is important that students are focussed on the amount of sugar consumed rather than number of drinks consumed, as this is what the problem is asking.

4. It is always important to state where the data has come from. Complete the sentence: The data for this statistical investigation was obtained from... Students complete the sentence, stating how the data has/will be obtained. This activity has been written for to allow for both collecting data from the class and obtaining it from CensusAtSchool so while the suggestion is that students survey students in their class, you could also obtain a random a sample of data from CensusAtSchool or the sample data provided if time is limited.

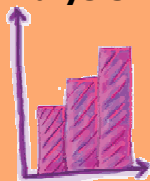
Data



Statisticians often use a table like this to organise their data. Why do you think it is important to have organised data? Students may record their data in any format as long as it is clear and easily manipulated. A table is usually the best format as it is clear and simple to read. Data from CensusAtSchool is available: Download a sample of 17, display in an excel file and make available for students to copy. The cups/glasses are approx 250 ml servings. Refer to teachers support sheet.

Students should complete the table: finding totals for both how much each student drank as well as how much of each type of drink was consumed.

Analysis



1. Have a look at the table of data on the first page (the big one). What do you notice? An important skill students should start to develop is looking at the data (like a Data Detective). This should help them develop statistical thinking skills. There are many things happening in their table but some of the key things could include (what was the most popular drink. Who drank the most/least, each row represents a student and columns represent different drinks.

2. Who drank the most? This question encourages reading information from the table from the rows

3. Which drink was the least popular? This question encourages reading information from the table from the columns

4. Which drink was the most popular? Another question to read from the column totals

5. How many glasses/cups did the students drink of this drink in total? State the total number of that particular drink consumed.

6. Create a graph that shows the information from the table.

Students should be encouraged to create their own graphs rather than being told which graph to use so that they have ownership of the discovery process. It doesn't matter which graphs they use to plot the data, as long as they are investigating the stories in it and the graph is suitable for the type of data. The first graph already has its axes drawn so students are forced to think about what column of information they will plot. They are encouraged to collapse this information into the table which follows and for the final graph they are encouraged to plot this information. The bars on a bar graph should be ordered from highest on the left to lowest on the right.

They will find that not all students drink the same number of drinks or the same types of drinks. This means the plotted data is not uniform. One of the key aims of statistics is to deal with the variation in data and to say whether it is natural or random or whether it is caused by something else. You might like to ask students to think about what the graph would look like when their parents were at school.

How many drinks did these students drink in total? This value can be found in the bottom right hand corner of their table if it is filled in.

If another student was asked what they drank yesterday, what drink do you think they would have drunk the most? Appropriate drink **Why?** It has the highest bar in the graph (or similar)

7. Which drink has the most sugar? Fizzy drinks

8. What drinks have no sugar? Water and diet soft drinks.

9. A teaspoon of sugar is 4g. Why do you think tea or coffee have 0+4? Tea/Coffee and Milo. The +4 represents 1 tea-spoon of sugar (4 g). The 1 spoon per glass was an approximation, and can be changed if so desired. Students filling in their own value should add 4 g per spoon of sugar. For example. A student who adds 3 spoons of sugar to their Milo would have $4+12 = 16$ g of sugar.

NOTE * milk Sugar content of milk has been averaged as C@S did not differentiate between types of milk.
**** Other** Due to the wide range and types of drinks this category could include. 'Other' included drinks such as flavoured water (6~9 g per 250 ml) as well as energy drink such as V, Red bull and so on (31 ~37 g per 250 ml)

10. Each drink contains a certain amount of sugar which is measured in grams (g).

A student who drank 2 cordial drinks yesterday guzzled how much sugar? 50 g

What if they also had 5 cups of water and 1 glass of milk? What would their new total be? 61 g

Can you estimate the amount of sugar the student would guzzle in a year? The students must multiply the value by 365 (days in a year) $61 \times 365 = 22265$

Divide your total by 1000 to find the answer in Kilograms Sugar guzzled in a year = 22.265 kg. To convert grams to kilograms, divide the grams by 1000. $22265/1000 = 22.265$.

11 Use the tables/charts and your own investigative knowledge to estimate how much sugar an average student 'guzzles' in a year. _____ kg.

Student should be encouraged to re-evaluate their initial predictions. Students can use information from the tables they filled in and the questions they answered previously. Students should be encouraged to discuss their predictions with their group or the class.

The way the students complete the table may require some support from the teacher:

Sample student A, B and C from the sample provided have been demonstrated on the following page.

	Water	Fruit juice	Cordial	Fizzy drink	Diet fizzy drink	Sports drink	Milk -not flavoured	Smoothie or shake	Tea or coffee	Hot Chocolate or Milo	Other	TOTAL Yesterday	TOTAL for Year
Sugar in grams	0	26	25	27	0	24	11*	22	0+4	4+4	20**		
Me												g	kg
A	0	78	0	0	0	0	11	0	0	0	0	89g	32.5 kg
B	0	0	0	0	0	0	22	0	0	0	0	22g	8 kg
C	0	26	0	0	27	0	0	0	0	0	0	53g	19.3 kg

Although student 'A' also had a glass of water, water contain 0 sugar. 3 fruit juice $3 \times 26 = 78$
 Total Yesterday is $78 + 11 = 89$. Total for year is $89 \times 365 = 32485$ grams. Divide this by 1000 to convert in kg. $32485/1000 = 32.485$ or 32.5 kg (1 decimal place).

Work out how much each student drank. Students are required to find out how much sugar each student in the sample consumed.

12. Which student drank the most sugar? Can be found from table or graph

13. How much sugar did they drink? Can be found from table or graph

14. Which student drank the least sugar? Can be found from table or graph

15. How much sugar did they drink? Can be found from table or graph

Find the mean. (hint: add up all the kg's in your total for year and divide by how many students there were in your sample, including yourself)

$$\text{Mean} = \text{mean from sample data} \quad \frac{\text{Total kg}}{16} = \frac{400.77}{16} = 25 \text{ kg.}$$

Find the mode (hint: is there a most frequently occurring kg total?)

Mode = 0,22 & 77 (g) or 0, 8 & 28.1 Kg respectively

Find the Median. (hint: Order the total kg's from smallest to largest and find the middle)

Median 0,0,22,22,23,57,56,57,77,77,89,98,104,114,150,156 (g)

$$\frac{57 + 77}{2} = \frac{134}{2} = 67 \text{ (g) (convert to Kg) } 24.5 \text{ Kg}$$

Look at each of the averages you found and look at the table. Which average do represents the data the best? Mean or Median

How did you decide? Mean – No outliers, Median – middle of the data

Therefore, the average amount an average student from my class or from a sample from CensusAtSchool 'guzzles' is kg. value to be used in conclusion.

Record your thoughts about your **graph** using these sentence starters:

I noticed what interesting features did students notice about the graphs

I wonder why/what does the information make them interested in.

Record your thoughts about your **averages** using these sentence starters

I noticed what interesting features did students notice about the data

I wonder why/what does the information make them interested in.

Student's conclusions should relate back to their original question. They should also mention any features they had noticed or wondered about and investigated.

A list of statistical language has been provided to help students construct a conclusion.

Who would be interested in your conclusion? This is a very topical issue. Health professionals/ school canteen/tuck shop, students/parents/teachers.

Conclusion



mean
middle
shape
problem
order

data
statistical
reason
mode
year

average
investigation
conclusion
graph
median

Useful phrases for conclusion:

From this sample
The average amount of sugar
The bar graph indicates
XXX was the most popular drink

Preselected CensusAtSchool data 25/08/05

drinks in a day	Water	Fruit juice	Cordial	Fizzy drink	Diet fizzy drink	Sports drink	Milk -not flavoured	Smoothie or shake	Tea/coffee	Hot Chocolate	Other	Total in grams for 1 day	Total kg for 1 YEAR
Me												g	kg
A	1	3	0	0	0	0	1	0	0	0	0	89	32.5
B	3	0	0	0	0	0	2	0	0	0	0	22	8
C	1	1	0	1	0	0	0	0	0	0	0	53	19.3
D	0	0	0	2	0	0	4	1	0	2	1	156	57
E	2	0	0	2	0	0	1	0	1	1	0	77	28.1
F	3	0	0	0	2	0	1	0	1	1	0	23	8.4
G	1	0	0	2	0	0	0	0	0	0	3	114	41.6
H	2	2	0	0	0	0	2	2	1	1	1	150	54.8
I	0	0	4	0	0	0	0	0	1	0	0	104	38
J	3	0	2	1	2	0	0	0	0	0	0	77	28.1
K	5	0	0	0	0	0	2	0	0	0	0	22	8
L	2	0	0	0	1	0	0	0	0	0	0	0	0
M	1	0	0	0	0	0	3	0	0	3	0	57	20.8
N	5	1	0	0	0	0	2	0	0	1	0	56	20.4
O	4	0	0	2	0	0	0	2	0	0	0	98	35.8
P	12	0	0	0	0	0	0	0	0	0	0	0	0
Total	45	7	6	10	5	0	18	5	4	9	5		

Amount of Sugar in Drinks											
Type of Drink	Water	Fruit juice	Cordial	Fizzy Drink	Diet Fizzy drink	Sports drinks	Milk -not flavoured	Smoothie or shake	Tea or Coffee	Hot Chocolate or Milo	Other
Sugar per cup/glass in grams	0	26	25	27	0	24	11*	22	0+4	4+4	20**