

Descriptive Statistics Worksheet

using MINITAB 14



Effects of Breakfast on Children's Hunger and Calorie Consumption

Introduction

This worksheet uses data on a sample of children who took part in a study of the effects of different types of breakfasts on how hungry children are and how much they eat at lunchtime.

The children ate their usual breakfast one day and different test breakfasts on three other days. On each day of the study, their hunger and calorie consumption at lunchtime were recorded. The test breakfasts consisted of one breakfast with a low glycemic index (GI), a low GI breakfast with added sugar and a high GI breakfast. The glycemic index refers to how fast the energy from the breakfast is used by the body: the energy from foods with a low GI is released slowly over a long period. Foods with a high GI give a quick energy boost but only for a short period. It is thought that this makes low GI foods more satisfying than high GI foods.

Some of the exercises in this worksheet are concerned with comparing the calorie consumption and other characteristics of boys and girls, while other exercises are concerned with the effects of different breakfasts on the calories consumed at lunchtime.

Getting started

The data are supplied in Excel format in the file *Breakfast.xls* which contains thirteen columns of data on 37 children.

- Start MINITAB and from the main menu select **File > Open Worksheet**
- In the dialog box that appears choose to view **Files of type:** Excel(*.xls)
- In the **Look in** box navigate to the folder containing *Breakfast.xls*
- Click on this file and then **Open**.

The five variables used in this worksheet are:

<i>gender</i>	1 = Boy, 2 = Girl
<i>bmi</i>	Body Mass Index, a measure of weight relative to height $\text{BMI} = \frac{\text{Weight}}{(\text{Height})^2}$, the units of which are kg/m ²
<i>wtstatus</i>	Weight status 1 = normal, 2 = overweight, 3 = obese
<i>hunusual</i>	Hunger rating after usual breakfast 1 = extremely hungry to 7 = extremely full
<i>ccusual</i>	Calories (kcal) consumed at lunchtime after eating usual breakfast

You will find it easier if you first recode some of these variables.

To recode the value of 1 to boy and 2 to girl

- Select **Data > Code > Numeric to Text**
- Select *gender* for **Code data from columns**
- Select *gender* for **Into columns**
- Enter the values 1 and 2 in the **Original values** column
- Enter boy and girl in the **New** column
- **OK**

Q1. Are these variables nominal, ordinal, interval or ratio level?

	Nominal	Ordinal	Interval	Ratio Level
Gender	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Body Mass Index	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weight status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hunger	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lunchtime calorie consumption	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Gender and weight status

Start to explore the data by producing frequency tables for the variables that classify children as belonging to one category or another:

- Select **Stat > Tables > Tally Individual Variables**
- Select *gender*, *wtstatus* and *hunusual* as the **Variables**
- Under **Display**, select **Counts**, and **Percents**
- Click on **OK**

Use your tables to answer the following questions:

Q2. How many boys and girls took part in the experiment?

Q3. What percentage of the sample were classified as overweight or obese?

**Q4. What percentage of children were hungry or extremely hungry by lunchtime?
Do you notice anything about the range of answers given to this question?**

Gender differences in BMI

Now turn your attention to the values of Body Mass Index (BMI). You are going to use summary statistics to compare boys and girls:

- Select **Stat > Basic Statistics > Display Descriptive Statistics**
- Select *bmi* as the **Variable**
- Select *gender* as the **By variable**
- Click on **OK**
- Type Ctrl+E to edit the last dialog
- Clear the **By variable** entry
- Click on **OK**

Your output should include the following:

Variable	gender	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median
bmi	boy	15	0	17.999	0.484	1.873	15.244	16.154	18.113
	girl	22	0	19.708	0.831	3.896	13.664	16.329	20.196

Variable	gender	Q3	Maximum
bmi	boy	19.585	21.621
	girl	22.253	28.782

Variable	N	N*	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3
bmi	37	0	19.015	0.544	3.308	13.664	16.279	18.378	20.956

Variable	Maximum
bmi	28.782

**Q5. What kind of BMI values do the children have on average?
Do boys or girls in the sample have the higher average BMI?
In which group of children is BMI more variable?**

Lunchtime calorie consumption

Now explore *ccusual*, the lunchtime calorie consumption for this sample of children.

Generate descriptive statistics, draw a histogram and draw a boxplot

- Select **Stat > Basic Statistics > Display Descriptive Statistics**
- Select *ccusual* as the **Variable**
- Click on **Graphs**
- Select **Histogram of data**
- Select **Boxplot of data**
- **OK > OK**

Use your output to answer the following questions:

Q6. How many calories on average did the children eat?

Q7. How much did the calorie consumption vary from one child to another?

Q8. What was the shape of the distribution?

Q9. Were there any values that seemed to be unusual in this sample?

Q10. Which summary statistics do you think are the best for describing calorie consumption?

Now use a diagram and summary statistics to compare the calorie consumption of boys and girls in the sample.

- Select **Stat > Basic Statistics > Display Descriptive Statistics**
- Select *ccusual* as the **Variable**
- Select the **By variable** option with *gender* entered
- Click on **Graphs**
- Ensure **Boxplot of data** is selected
- **OK > OK**

Read through the output and use it to answer the following questions:

Q11. Looking at the box plot, what summary statistics are best for describing the calorie consumption for boys and girls?

Q12. What are the typical values of calorie consumption for boys and girls?

Q13. Is the variation in calorie consumption the same for boys and for girls?

Q14. Did the sample include any children who ate unusually high or low numbers of calories?

Lunchtime hunger levels

Now compare how hungry girls and boys were at lunchtime. As before, you are comparing two groups of children but this time the characteristic being compared is one that puts individuals into categories. A two-way table can be used.

Recoding of variable hunusual

To recode the hunger value ratings:

- Select **Data > Code > Numeric to Text**
- Select *hunusual* for **Code data from columns**
- Select *hunusual* for **Into columns**
- Enter the values 1, 2, 3, 4, 5, 6, 7 in the **Original values** column
- Enter extremely hungry, hungry, quite hungry, normal, quite satisfied, satisfied, extremely full in the **New** column
- **OK**

To obtain the two-way table:

- Select **Stat > Tables > Cross Tabulation and Chi-Square**
- **For rows** select *hunusual* and **For columns** select *gender*
- Under **Display** select **Column percents**
- **OK**

**Q15. What were the most and least common responses?
Did the boys and girls give different answers?**

Obesity levels

To recode the weight status value ratings:

- Select **Data > Code > Numeric to Text**
- Select *wtstatus* for **Code data from columns**
- Select *wtstatus* for **Into columns**
- Enter the values 1, 2, 3 in the **Original values** column
- Enter normal, over weight, obese in the **New** column
- **OK**

Now compare the weight status classifications of boys and girls.

- Select **Stat > Tables > Cross Tabulation and Chi-Square**
- **For rows** select *wtstatus* and **For columns** select *gender* as the **Classification variables**
- Under **Display** select **Column percents**
- **OK**

Q16. What does the table tell you about the weight status of boys and girls in the sample? Remember to look at the *percentages* of boys and girls classified as belonging to each category.